POPULAR AVIATION

November

1937

25¢

The National Air Races

XUM

One-Two for Laird in the National Air Derby!

Both ships a year old.

These ships flown a total of 200,000 miles.

Both ships with records clear of any major repairs.

The National Air Derby, New York to Spokane, September 21, was a Laird Sweepstakes!

First was taken by C. W. Holman in Laird Commercial C-240. Second, by E. E. Ballough in Laird Commercial C-110. It is significant that both are standard commercial jobs, with a total of 200,000 miles to their credit, and no major repairs of any kind.

It is further interesting that C-110, which placed second, is the same plane used for a record trip between Chicago and New Orleans—1960 miles in 16 hrs. 20 min. And did 70,000 miles air mail service.

Commercial plane users will do well to consider that these ships competed against numerous entries built especially for the Derby. When two entries of standard jobs, built a year ago, can enter an event of this importance and place one-two, commercial job buyers will be interested in further facts.

E. M. LAIRD AIRPLANE COMPANY, 4500 West 83rd St., Chicago, Ill.

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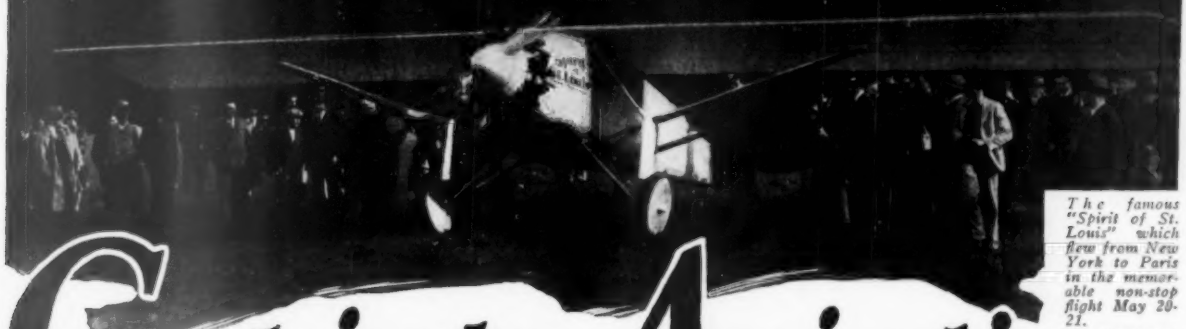
You Daring Young Men Seize Life's Biggest Thrill!



The famous "Spirit of St. Louis" which flew from New York to Paris in the memorable non-stop flight May 20-21.

Wide World Photo

Get into Aviation

WHAT thrill could compare with this—what sport could bring you the tingling, breath-taking adventure of this fascinating, new occupation—the game for men with sporting blood! See life—win applause—thrills—big money—step into a field of excitement and daring—away from the monotony of tame, narrow humdrum everyday life!

Think what Aviation offers you. Thrills such as you never had before! The praise and plaudits of the multitude. And a chance to get in on the ground floor where rewards may be unlimited!

Amazing Opportunities

Aviation is growing so swiftly that one can hardly keep track of all the astonishing new developments. Air mail routes have just been extended to form a vast aerial network over the entire U. S. Airlines and airplane factories are springing up all over the country. Men like Henry Ford are investing millions in the future of commercial Aviation in America! The possibilities are so tremendous that they stagger imagination!

Everything is set for one of the greatest booms in history. Big fortunes came out of the automobile industry and out of motion pictures. Big fortunes will also come out of Aviation. The development of Aviation as an industry is bringing with it a call for trained men. Those who qualify quickly should find themselves on the road to unusual earnings—success—popularity—and prominence.

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Get into this thrilling business at once while the field is new and uncrowded. Now—by a unique new plan—you can quickly secure at home, during spare time, the preliminary training necessary to get a start in the Aviation Industry. Experts will teach you the secrets—give you the inside facts that are essential to your success. And the study of Aviation by our method is almost as fascinating as the actual work itself. Every lesson is chockful of interest—and so absorbing that you actually forget you are studying. But best of all are the ultimate rewards you are fitting yourself to gain.

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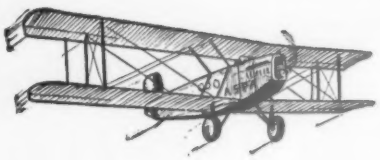

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The American Society for Promotion of Aviation was organized by 12 ex-service aviators at the Army and Navy Club, New York City, in 1925.

Our objects as incorporated are to "arouse and maintain interest in aviation" and eventually to

"MAKE-AMERICA-SUPREME-IN-THE-AIR"

We can accomplish our objectives by having a landing field or air port in every town, and by training red-blooded Americans in the art of flying.

FLYING CLUBS WILL BE ORGANIZED IN EVERY COMMUNITY.

THIS WORK ENDORSED AND SUPPORTED BY AMERICA'S LEADING AIRMEN.

You can participate in this great movement by becoming a member of THE A. S. P. A., and, as our representative, work for aviation in your community.

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POPULAR AVIATION

Published Monthly

A magazine for everyone interested in aviation progress and development.

Volume 1 NOVEMBER, 1927 Number 4

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No Comment Needed

My dear Editor:

I am only a stenographer, but what that has to do with my writing this letter to you will soon be revealed.

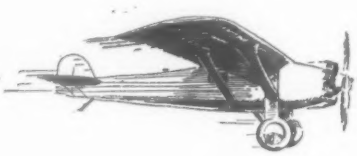
Several days ago I was making copies of program material for "friend boss," and among the suggested topics was one which caught my fancy. It was this: "Remaining Loyal Under Difficulty." Immediately my thoughts reverted to your editorial entitled "Flying Is Safe" in the September issue of POPULAR AVIATION.

It seems to me that at no time has the need for loyalty been so urgent as just now when the many tragedies of the air are so fresh in the minds of the reading public. It has intimidated those who were lukewarm toward aviation, and has been meat and drink for the openly antagonistic, the "I-told-you-so's."

Can you believe me when I say that I have close relatives who have branded Lindbergh, Chamberlain and Byrd as fools? They are of the type who see an aviator merely as a peculiar species of human who will jeopardize his neck for notoriety. Unhappily, far too many of our laity comprise this class. I have had the good fortune to have been taken up in a plane, but were I to reveal this "secret" to those of my kin who are so hopelessly land-bound, the hazard would be greater than was the actual flight. Such is their antagonism toward anything aeronautical.

I am just a woman aviation enthusiast—have been for some years—with little outlet for my enthusiasm; but I hope that your "sales talk on aeronautical safety" will have far-reaching effect. To this end, the gods of the air be with you.

Let us, then, remain loyal—loyal to those who are giving their time to the propagation of this great enterprise; loyal to the spirit of those who have given their lives to made aviation safe for America.



XUM

The National Air Races

The Event of the Year

ON September 21 at 2:17 p. m. the watchers at Felts Fields, Spokane, Wash., were rewarded for the hours of waiting by seeing N. C. Lippiatt, in a Travelair, cross the finish line as the winner of the Class "A" division in the race from San Francisco.

From that time until long after five o'clock the Air Derby entrants from both San Francisco and New York arrived at intervals. Of the fifteen starters from New York in Class "A," for planes of greater than 100 horsepower, the first four to place were:

C. W. Holman, St. Paul (Laird).
E. E. Ballough, Chicago (Laird).
N. B. Mamer, Spokane (Buhl).
J. P. Wood, Wausau, Wis. (Waco).

Of the twenty-five starters in Class "B" that left New York the first four to place were:

C. W. Meyers, Detroit (Waco).
J. S. Charles, Richmond (Eaglerock).
E. Dettmers, Tarrytown (Travelair).
L. Miller, Des Moines (Eaglerock).

Four of the five entries in Class "A" from San Francisco finished in the following order:

N. C. Lippiatt (Travelair).
Lee Schoenhair (International).
Vance Breese (Breese).
Jack Frye (Fokker).

The first three arrivals from San Francisco in Class "B" were:

C. L. Langdon (International).
D. C. Warren (Travelair).
Lee Willey (Eaglerock).

The flyers from San Francisco reported good flying all the way, with the exception of the Columbia Valley, which was rather foggy. However, the New York racers had many experiences that made the race a hard one. Holman lost a tire taking off at Butte and had to land at Spokane on one wheel. Dettmers finished third in spite of much trouble, flying a straight compass course at nearly 8,000 feet elevation. At one time his magneto became water soaked and he had to make a forced landing and waste nearly half an hour in repairs. He lost another fifteen minutes repairing a gasoline feed line. At Missoula he blew a tire in landing.

The non-stop flight from New York to Spokane was not finished. The two entrants were compelled to land and thus disqualify themselves.

In the Aviation Town and Country Club event, for speed and efficiency, held on the 23d, James Ray of Willow Grove, Pa., in a Pitcairn sesquiplane, raced to first place with an average speed of 138.394 miles per hour, with E. E. Ballough of Chicago winning second with 132.361 miles per hour, in his Laird Commercial. The same two then proceeded to win the Seattle Chamber of Commerce trophy races in the same order.

Charles ("Speed") Holman, winner of the Class "A" race from New York to Spokane, piloting a Laird Commercial.

Lieut. W. C. Cornelius of Selfridge Field, Mich., flying in the first event for military planes, won the pursuit race with an average speed of 155.412 miles per hour. Lieut. I. A. Woodring was second with 155.046 miles per hour for the sixty-mile race around the six-mile course. Lieut. L. C. Mallory was third with an average speed of 153.66 miles per hour.

In the speed and efficiency race for commercial ships for the trophy offered by the Detroit News, F. N. Hawks of Houston, Texas, won first place in his Ryan brougham, with an average speed of 104.837 miles per hour. Jack Frye, Los Angeles, in a Fokker Universal, was second, with 100.065 miles per hour, and John H. Miller, Milwaukee, third, in a Hamilton at 96.509 miles per hour.

The following day in the speed contest for the Liberty engine builder's trophy, two specially motored Curtiss ships won the first two places with ease. Lieut. H. A. Johnson of Wright Field won first with 170.156 miles per hour, with Lieut. G. A. McHenry of Fort Crockett, Texas, second.

The race for commercial planes was won by Eugene Dettmers of Tarrytown, N. Y., in a Travelair, who averaged 102.548 miles per hour for 80 miles. Paul Richter, Jr., of Los Angeles, won second in his Eaglerock, and C. W. Meyers, of Troy, Ohio, in a Waco, was third.

The army's giant tri-motored Fokker from Bolling Field, Washington, piloted by Lieut. W. H. Beaton, of Langley Field, won the Packard Motor Company trophy race for capacity planes over a distance of sixty miles. The speed average was 115.198 miles per hour. Lieut. W. H. Doolittle of Selfridge Field came in second in the Douglas transport, with an average of 100.343 miles per hour, while Lieut. T. K. Koenig of Crissy Field, was third in a Douglas, with an average of 81.285 miles per hour.

E. B. Heath of Chicago won two races without competition in his midget Heath parasol, owing to the withdrawal of Jack Irwin of Sacramento, Cal.

Immediately at the close of the races at Spokane the field of over 65 planes left for Portland, Ore., for the additional races that were to be held at that city as a dedication of the new Swan Island Airport.

"Speed" Holman was the first airman to arrive, making the trip from Spokane in order to look the route of the race over before making the attempt the following day. On September 27 the military planes arrived in Portland

and the inhabitants were treated to formation and stunt flying by the crack flyers of the army and national guard.

In the afternoon the racers in both Class A and B began to arrive, Holman winning first place by 27 seconds. E. E. Ballough was second and Nick Mamer third, with Lippiatt and Schoenhair coming in fourth and fifth.

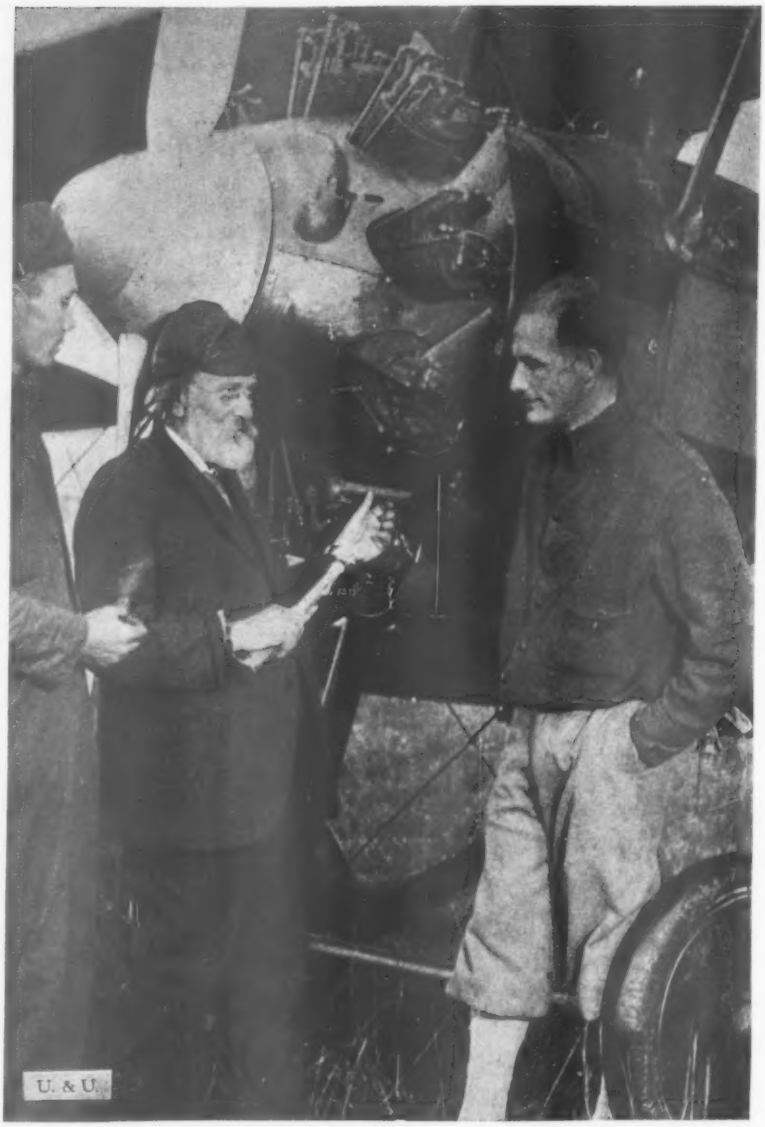
Terrific rains in both Seattle and Portland led to the postponement of the Class B race. A temporary decision to postpone the Class A race left several of the entrants out of it, and they retired from the field without being notified later that the Class A race would be held.

Defying adverse weather conditions, Portland's air derby was carried out on September 30th and witnessed by thousands of spectators who waited for the flyers for hours in a drenching rain on Swan Island aviation field.

The first to cross the finish line in the Class "B" events, Spokane to Portland race, was Leslie C. Miller of Des Moines, Ia., in his Eaglerock biplane. Close behind Miller came the winner of second place, C. W. Meyers of Detroit, flying a Waco biplane. Others of the 13 contestants continued to arrive during the afternoon.

The crowd at all times was intensely interested in the speedy field program, which was run off in nice shape despite the heavy rain. At one time there were 65 machines lined up along the field, and each the best of its type

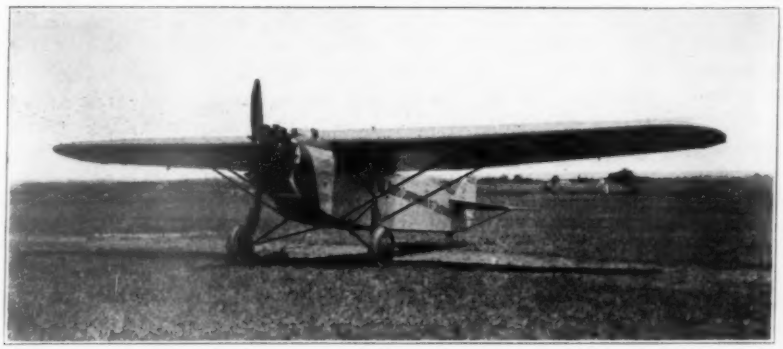
The stunt contest between Lieut. Doolittle of the army and Lieut. Sanderson of the marine corps proved most popular, as they both turned loose everything they had in the pursuit plane race. While the race was won by Lieut. Jeter flying a navy Boeing, the big performance of the race was staged by Doolittle, who



E. E. Ballough of Chicago (right) with Charles M. Dickinson, his passenger and backer, who has been flying for 17 years. Tony Mankiewitz is the other passenger.

N. C. Lippiatt, of Los Angeles, who won the Class "A" race from San Francisco in his Travelair monoplane.

Nick Mamer, who won third place in the New York to Spokane race in Class "A" in his Buhl Airster.



The Fokker Universal used by Jack Frye.

pressed Jeter all the way and showed his rudder to the other two navy contestants, both piloting planes of superior power.

Doolittle was piloting an army Curtiss, with a H. P. of 435 as compared with the 512 H. P. of the navy planes. Theoretically fourth place was the best the stunt flyer could expect.

Charles Meyers of Detroit (right) and his passenger, Thomas A. Colby, taken on their arrival at Chicago.

But theory was not traveling as a passenger with the determined and misnamed Mr. Doolittle. He made up for his lack of power by skillful handling. He flew close to the ground along the river every foot of the 35-mile race—about 500 feet lower than the other pilots. He banked at steep

C. L. Langdon, of San Francisco, who finished with the winners in his International.

J. S. Charles, Richmond, Va., in his Eaglerock entry for the Class "B" races.

Lieut. Harold W. Beaton

angles on the turns. The net results was that he came in on the heels of his faster rival with an average speed of 140.93 miles an hour. Lieut. Jeter averaged 146.96 miles an hour for the course. Another army flyer, Lieut. Cornelius, made a great race against Lieut. Regan of the navy, but the faster plane won third with an average speed of 140.41. Cornelius was fourth with an average of 136.16. Lieut. Woodring came in fifth and Lieut. Commander Bogan of the navy sixth.

Despite continuous downpour both the army and navy stunt flyers entertained the huge crowd and it was difficult for the judges to pick out the winner, both Sanderson and Doolittle's work being practically on a

Lieut. W. L. Cornelius

par. However Doolittle was given first place on account of his entering all events of the day.

In the ten-lap speed race for commercial airplanes J. P. Wood of Wausau, Wis., flying a white Waco, won with an average time of 111.3 miles an hour. M. B. (Nick) Mamer of Spokane, flying a Buhl airster, was second, averaging 100.04 miles an hour.

The race for observation planes, a strictly military event, brought out a dozen army, navy and marine corps biplanes, evenly divided between De-Havilands and Douglas o-2s. The ten-lap race was won by Lieut. Taylor of the army in a Douglas. A De-Haviland, piloted by Lieut. Beverly of the army, annexed second, and two Douglases, with Lieuts. Burgess and Grant, both army, got third and fourth. Taylor's average for the distance was 106.92 miles an hour.

Only three planes were entered in the small commercial ox5 race, which was won by C. W. Meyers, Detroit, in a Waco 10 biplane. Paul E. Richter, Jr., Los Angeles, flying his Eagle-rock biplane, took second. Tex Rankin, third entrant, dropped out before the completion of the race, when he saw that his low-powered Waco was unable to keep up the pace. Myers made the five laps in 13 minutes 26.27 seconds for an average of 83.87 miles an hour. Richter made the course in 13 minutes and 40.63 seconds, an average of 82.45 miles an hour. Prizes were $100 and $50.

Lieut. G. W. McHenry

Lieut. Harry A. Johnson

Guiding Planes by Radio

A FEW days ago Earl C. Hanson, formerly of the Radio Division, Bureau of Engineering, Navy Department, Washington, D. C., walked into the offices of POPULAR AVIATION and treated the staff to a demonstration of one of the latest developments in radio design, particularly as applied to aircraft use.

Mr. Hanson, who is the inventor of the radio piloting cable in use in harbors for the guidance of ships, and the Panatrope, a radio-phonograph improvement, brought his entire apparatus with him in a traveling bag. He has designed and built a small, light and compact radio receiving and transmitting set, especially adapted for use in aircraft.

The one tube receiver is as compact as a camera, and not much larger, weighing, fully equipped with batteries, about 8 pounds. The sending set occupies about the same space and has the same weight, being operated by two 4½ volt "C" batteries.

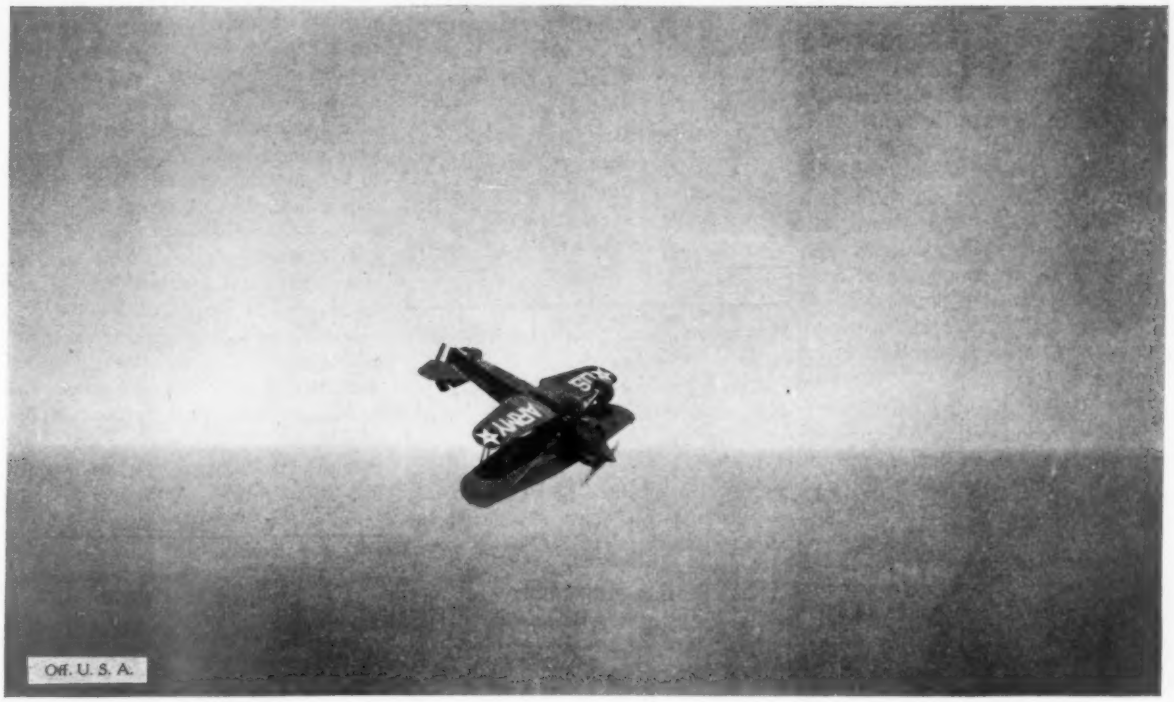
A steel skeletoned building in the Chicago loop district is one of the poorest places in the country to test a radio, but to make a further handicap Mr. Hanson both sent and received messages over an antennae of hair wire, a tiny strand of enameled copper wire so fine that it is thinner than hair. Messages came through with perfect clarity and with no distortion; and to simulate conditions in a moving airplane the receiver was shaken about while in operation and given severe jars, such as might be received in landing. Neither shakes nor jars had an effect on reception and did not cause any microphonic noises or distortion.

The application of this new device, of which we had the first public demonstration, to the field of aircraft, can follow several lines. As a sending set, nothing need be said, for the utility of a transmitter weighing less than two gallons of gasoline, even with batteries, needs no explanation. The receiving set, however, is capable of being used in several different ways. It is so arranged, in the first place, that it does not take an eletcrician to make replacements of the tube or batteries. No wires need be attached to the batteries, as they are pushed into place and connections are made automatically. The set carries a spare tube which can be replaced in less than one minute. This means that any flyer can keep the set in order. There are only two controls to manipulate, and they will give the full range from the 50 meter stations upwards.

This small receiver can be readily adapted to the inventors plan for using the radio cable piloting device.

(*Continued on page* 61)

XUM



Flight Training in the Army

By Captain Falk Harmel

Here is an authentic and interesting article on the instruction given to flying cadets in the United States Army. It gives a fairly complete picture of the course of training and is a companion article to "Earning Wings in the Navy," published in the October number of Popular Aviation.

INHERENT flying ability is an essential qualification which must be possessed by every candidate about to undergo flying training at the Army Primary Flying School. A student's career at the Flying School is ended abruptly unless he demonstrates to the satisfaction of his instructor that he possesses the knack of doing the right thing at the right time and is quick to react to a dangerous situation. Ability to think and act quickly in an emergency is stressed upon highly, for at one time or another not only the student's own life but the lives of other airmen flying in close proximity during formation work or combat maneuvers may depend on how well he exercises this ability.

When a student reports for flying training the authorities at the school exert every effort to determine beforehand whether he possesses the mental and physical ability to become a flyer. The flying training of a student is a costly proposition, hence the effort to eliminate candidates who, through lack of physical or mental qualities, would never become proficient flyers. Physically, a student must be well nigh perfect, particular stress being laid on eyesight and hearing. Mentally, he must demonstrate that he has the knack of catching on quickly, the ability to do more than one thing at a time, to orient himself promptly with relation to fixed points in actual flight, and to use sound judgment.

Certain students are found to possess inherent flying ability to a greater or lesser degree, and in a short space of time feel as much at ease in the air as in the water when learning to swim. Others soon demonstrate that they will never become good flyers regardless of the amount of instruction which may be given them. The handicaps which would bar one from becoming a good automobile driver, such as timidity, excitableness, indecision, etc., apply with much greater force in the case of a flying student. Airmen who have saved their lives through quick-witted actions have often been asked how they happened to hit upon the right thing to do in the emergency. Their reply invariably was that they did not stop to think but acted on the impulse of the moment—mechanically as it were.

One of the methods in vogue at the Army Primary Flying School to determine a candidate's aptitude for flying is to give him one or more sessions with the Ruggles Orientator, an apparatus developed during the late war for this purpose. Briefly, this apparatus consists of a cockpit of an airplane suspended in three concentric rings. It is operated by motors and governed by a control stick in the cockpit as well as by a control stick

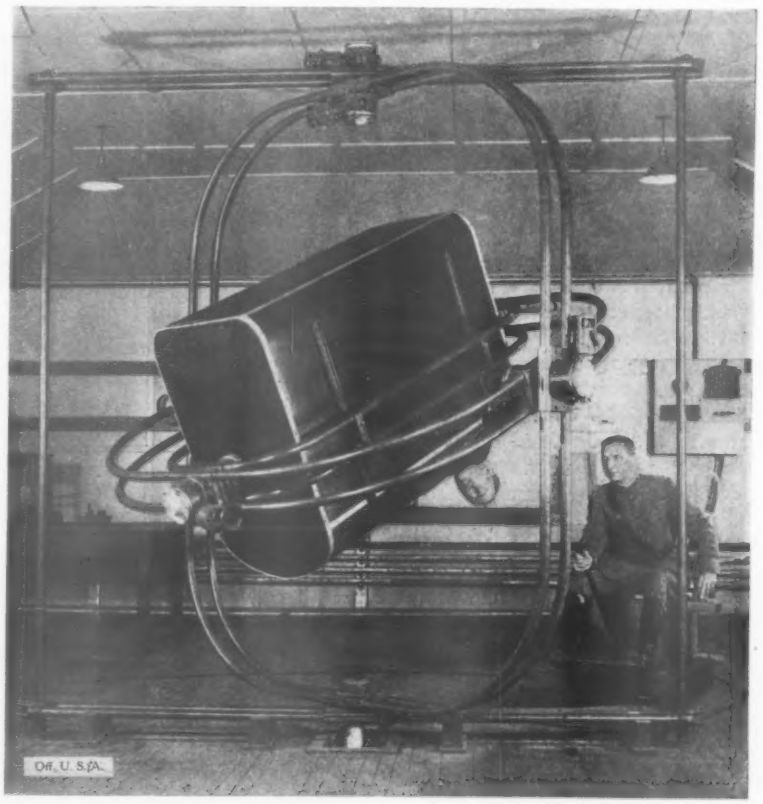
and rudder near the instructor's chair on the ground. By a combination of movements of the stick and rudder, the Orientator can simulate all the evolutions of an airplane in flight except straight forward or up and down motions. In other words, it can be looped, rolled, spun, put through a tight spiral, an Immelmann turn, etc. These movements, however, are performed at a greater angular velocity than during actual flight, and hence the effects on the occupant are more severe than those experienced in an airplane.

The purpose of using the Orientator in connection with a student's flying training is to accustom him to the rapid changes in his position in space with respect to the horizon, so that when he begins to make flights in an airplane he will be less confused and less apt to meet with accidents during his early training. A student's behavior while an occupant of the Orientator gives a fairly accurate indication of his "inherent ability to fly." The instructor controlling the Orientator maneuvers it into all sorts of positions and the student must so manipulate his controls as to bring the apparatus back to normal position. It is at this critical time that the student reveals whether he is cool-headed and quick to react to dangerous situations. In a good many cases a student who performs poorly in the Orientator is likewise a poor pupil when he is taken up in flights by his instructor. Every opportunity is given the student to make good. If his first instructor can make no headway with him, he is assigned another instructor. If his second instructor finds him inapt, the student is assigned still another instructor. Should the three instructors agree on the student's inability to pilot an airplane, he is directed to appear before a board of officers—the "benzine board" in aviation parlance —given an opportunity to state his side of the case and to challenge the testimony of his instructors. The student is then excused and the board, acting the same as a jury, decides whether he is to be given another opportunity or honorably discharged

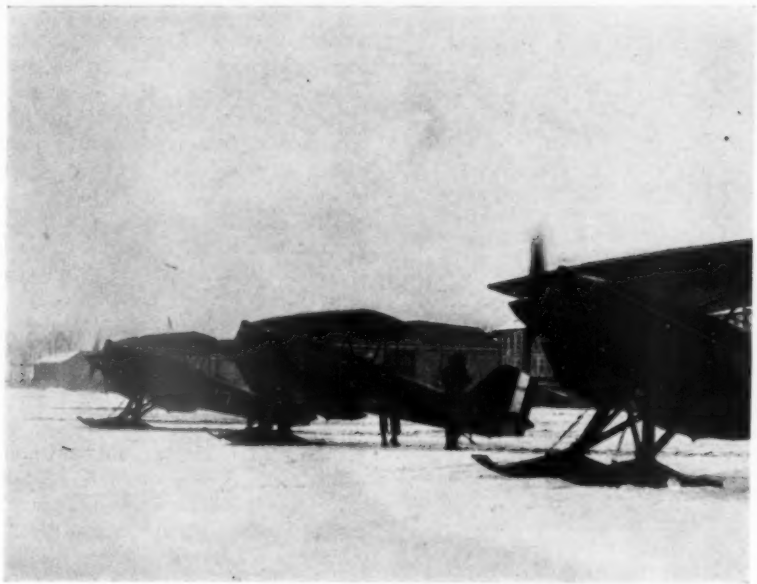
As to the reason why a backward pupil is assigned more than one instructor, it may be stated that it has often been found that one instructor will exert a more steadying influence on a particular student and cause him to acquire greater self-confidence than would another instructor, also that where one student would literally go to pieces under the tutelage of his first instructor he would perk up and make steady progress under his second or third instructor, thus demonstrating the complexities of human nature. Some students may strive all the harder under adverse criticism while others easily become discouraged. As a rule, the successful baseball manager is the one who adopts varying methods, according to the temperament of the individual, to secure the best efforts from his players. Constant driving tactics must be applied to some, while others, sensitively inclined, must be patted on the back and given an encouraging word now and then. The flying student is not much more different from the average ball player so far as concerns the methods used in instructing him.

When Colonel Lindbergh reported as a flying cadet at Brooks Field, he soon demonstrated that he possessed "inherent flying ability" to a marked degree, and flying to him was as instinctive as breathing. Towards the end of his flying course he was selected for specialized training in pursuit aviation, a branch of flying which demands quick thinking and excellent piloting. Incidentally, it may be remarked that so great an interest was created in aviation as a result of his momentous New York to Paris flight that the Army Air Corps was literally flooded with applications from young men for appointment as flying cadets. These numerous applications enabled the Army Air Corps to change its policy with respect to the acceptance of candidates as student flyers and to use much more discrimination in selecting them. To be eligible for appointment as flying cadet, a candidate

If you are interested in knowing whether or not you are eligible to enter one of the Army Air Schools, turn to page 34 of this issue of Popular Aviation, where you will find an article giving all the requirements for enlistment.



The Ruggles Orientator, used in determining a candidates' reaction to conditions in the air.



Curtiss Hawks with skis for winter use.

must now have at least two years of college work or the equivalent thereof. The course at the Primary Flying School has been lengthened from six to eight months, and graduating students are then transferred to the Advanced Flying School at Kelly Field, Texas, for a four months' advance course. Thus, a student must undergo a year's training before he graduates as an airplane pilot.

Legislation enacted by Congress expanding the Army Air Corps made necessary the creation of additional facilities for flying training. March Field, Riverside, Calif., which was used during the war and for several years thereafter as a flying school and then abandoned, has been re-established and, beginning in September, primary flying training will be conducted there as well as at the present well established school at Brooks Field, Texas.

Instruction at the Primary Flying School is divided into two phases, flying and ground work. Flying instruction is usually given in the morning, and the afternoon hours are devoted to the study of such aeronautical subjects as theory of flight, instruments, aero engines, meteorology, radio, telegraphy, aerial navigation, sketching and map reading, theory of photography, and the various military subjects with which every soldier must be acquainted.

It goes without saying that the corps of instructors are men who are eminently qualified to perform their duties. So carefully has the course of instruction in flying been planned that accidents are few and far between.

This summer a school for flying instructors was established at the Air Corps Training Center at Duncan Field, San Antonio, Texas. Three classes were conducted, each of one month's duration. All officers of the Army Air Corps on duty as flying instructors were required to take the course, the purpose being to establish a uniform method for the training of Army flying students. The most practical method of teaching a student each particular maneuver of an airplane has been adopted, and hereafter only that method will be followed.

It is much more difficult to train a student as a military flyer than as a commercial flyer, since the character of flying in the Army is so radically different from that in the commercial field. The commercial pilot, flying from one airport to another, only does straightaway flying with no frills. His job is to transport his passengers, mail or freight to a designated place. On the other hand, the military flyer cannot confine himself to straightaway flying, for to do so would greatly lessen his value in time of war, when planes must be maneuvered in every conceivable manner successfully to combat the enemy. In time of peace the military flyer is trained for duties which would devolve upon him in time of war. In his peace-time training, therefore, he must pilot planes designed for war service. In war, the pilot who flies the faster and more maneuverable plane has a great advantage over his adversary and has a much better chance of gaining the upper hand.

After the student has successfully passed the prescribed physical and

Air view of Brooks Field, Texas, one of the army air schools.

Air view of Kelly Field, Texas, looking westward.

mental examination upon reporting at the school, he is ready to begin his flying instruction. Actual flying does not commence, however, until several weeks subsequent to the date of the opening of the school, this in order to enable those without previous military training to receive instruction in infantry drill, the duties of a soldier, etc. Then the day is set for flying instruction to begin. Each flying instructor is assigned six students who are in turn taken up for a flight of 30 minutes each. The half hour flight on the first day is merely a joy ride for the student, the instructor giving him a sight-seeing tour of the country in the vicinity of the flying field. The next day the instructor explains to the student how the controls are manipulated in maneuvering the airplane. The student is told to place his hands lightly on the control stick and his feet on the rudder bar and to observe closely the effect of the movements of the stick and rudder. It must be understood, of course, that the training plane has two sets of identical controls, one for the instructor and the other for the student.

As these 30-minute periods of instruction progress, the student is taught how to take the airplane off the ground and land it, and how to execute the various maneuvers which an airplane is capable of performing. Normally, at the end of 20 lessons, or ten hours of instruction, a student is supposed to be able to perform solo work, that is, to pilot the plane by himself. Having demonstrated his ability to "solo," the student is transferred to the "solo stage." His flying instruction program from then on is to go up each day by himself for a 30-minute flight and follow this later with another 30-minute flight in company with his instructor. Each day his instructor teaches him a different maneuver on which to practice by himself the following day.

During the primary flying course the student spends approximately 215 hours in the air, during which time he is supposed to have acquired sufficient instruction and practice to make him a proficient pilot of the training type of airplane. He is then allotted 32 hours for cross-country flying, a like amount of time for formation flying and five hours for night flying, a grand total of 284 flying hours.

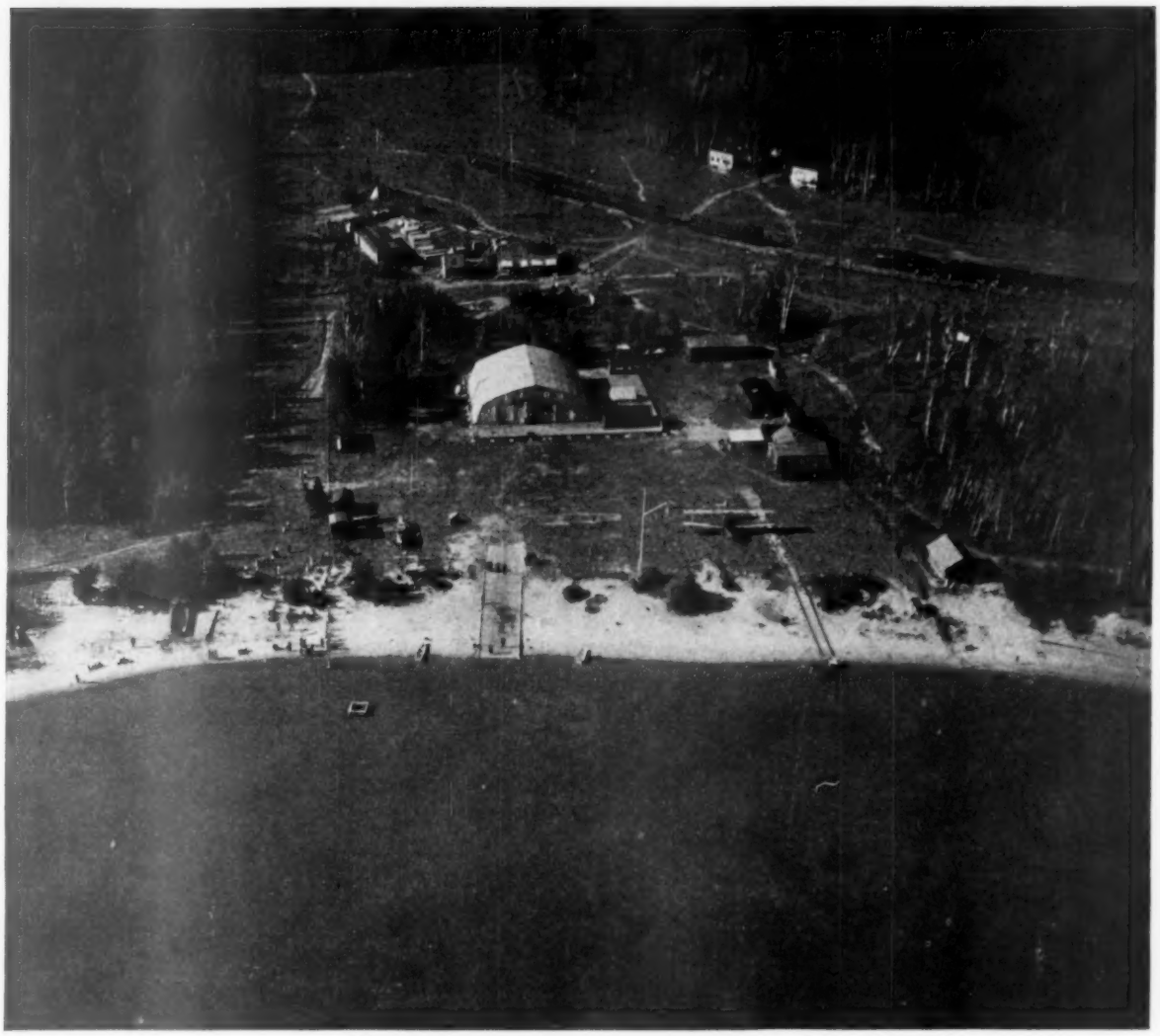
The student is now ready for graduation and he next finds himself at the Advanced Flying School at Kelly Field, Texas. Here he is given different types of two-seater service airplanes on which to try his skill, and he goes through another period of dual instruction, but along advanced lines. He is taught to maneuver the planes with minimum and maximum climb, methods of coming out of tight places in which he may find himself during maneuvers, climbing at various speeds and altitudes, flying through clouds, landing in small and strange fields, etc. He is also assigned missions requiring him not only to fly the ship but to do other things at the same time, as, for example, locating and sketching some particular field.

Having demonstrated his proficiency in piloting the two-seater service types of airplanes, little difficulty is, as a rule, experienced by the student in going through his next period of instruction, the transition stage, when he enjoys the new experience of flying the fast single-seater pursuit ships and the multi-engined bombing types. Following the transition instruction period, several days are spent in formation flying, followed by a brief amount of night flying.

(*Continued on page 61*)

Another view of Brooks Field, Texas.

XUM



Gee! It would be tough to be stationed here all summer!

Aviation in Canada

By E. L. Chicanot

INTEREST in the various phases of aviation has been steadily rising in Canada since the end of the war and at the present time has suddenly jumped to a point where attention from all directions is focussed upon developments. In some measure this has been due to the last Imperial Conference, in which Canada assumed a new aeronautical importance as a link in the projected chain of Imperial airways, and aerial matters in general received considerable stimulation. For the greater part, however, it has been due to somewhat of a sudden realization of the effective part aircraft has been playing on a very small scale in the national life of the country, which has engendered a new public faith and confidence. There is a new consciousness of the peculiar appropriateness of the plane to the nature of the broad Dominion and appreciation of the immense possibilities of utilization of the machine of the air in the peculiar manner in which the country's development is being achieved.

The giant strides made in the development of the aeroplane during the years of the Great War, together with the fact that the British flying services contained such a large proportion of Canadians, making available a substantial number of specialized, highly-trained operatives, brought Canada to see the wisdom of bending this newly perfected destructive agency to meet her peace-time needs and enter upon a program of aviation to be gradually expanded. Canada, it had already been pointed out by many experts, is a country where the use of aircraft should develop beyond most others and reach the closest to the ultimate in service. The years since the conclusion of hostilities have evidenced an increasing realization of this, with the areoplane coming to play an ever more impor-

The Air Station at Vancouver, British Columbia. Aviators in Canada seem to like golf.

tant part in the economic life and progress of the Dominion.

All aviation activities in Canada radiate from the Royal Canadian Air Force which in addition to the maintenance of the government service under the Department of National Defense, controls the inspection and licensing of all pilots and ground engineers. This may have been somewhat of an influence in aviation developing along rather singular lines in Canada, with the commercial side markedly subservient, though generally speaking this has been natural and logical. Very little progress has yet been made in the way of mail, express, or passenger services as in other countries and the greater volume of work has been carried out for various government departments in connection with the nation's vast possessions of natural resources.

Pilots for all branches of the Canadian flying services belong to the Royal Canadian Air Force, and present members have been very largely recruited from Canadians who served overseas with the Imperial Flying Services or received their training in Canada in the later years of the war. Insurance of an adequate personnel for the force is made through the continual instruction of new pilots. Young officers are drawn from the officers' training corps of Canadian universities and the Royal Military College, and during the summer vacation are given courses in flying at Camp Borden over a period of three years. Camp Borden is the depot and training ground of the Royal Canadian Air Force, the real center of Dominion aviation. For the carrying out of the various Federal Government operations other stations are maintained at Vancouver, B. C.; High River, Alta; Victoria Beach, Man.; Ottawa, Ont., and Dartmouth, N. S.

The principal work done from these is for forest protection and the plane has come nearest of all agencies to solving one of Canada's most acute and serious problems. The Forestry Branch of the Federal Government is using the air service more and more each year as the effectiveness of its work is more clearly demonstrated. The system of aerial patrols maintained in the forest reserves of Western Alberta for the prompt detection of fires covers an area of 3,000,000 acres, and this vast expanse is covered twice daily by airmen at the High River station during the season of fire hazard. In Manitoba 60,000,000 acres of timber are under observation from the station at Victoria Beach, and the proposal is to extend the system of air patrols as funds permit across Northern Saskatchewan and Alberta until the two present systems meet in the valley of the Athabasca. Quebec and Ontario, which own their own forest reserves, maintain their own flying services exclusively for forest patrol.

The general use of the plane has largely revolutionized forest protection in Canada, permitting a reduction in the size of ground forces, and at the same time carrying out the actual operations more effectively and reducing the annual destruction. Its advantages are obvious, especially when equipped, as these machines are, with wireless, putting the pilot into instant communication with his base, which telephones the nearest ranger station from which a crew is started immediately to suppress the fire. Fire fighting forces are even transported by plane frequently to the actual scene of the fire, the superiority of this means of travel over foot, canoe, or saddle being almost unbelievable. To give but one

A Vickers-Vimy Amphibian, used by one of the Canadian government bureaus.

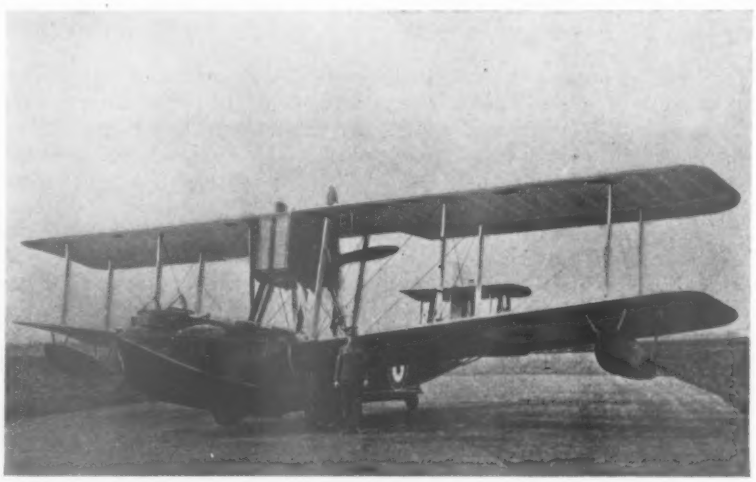


illustration. Two important points in Manitoba forest territory were formerly three days' journey apart by canoe, but fire fighting forces are now transported from one to the other in thirty-two minutes.

Subservient only to forest protection is aerial photography and mapping, a work of outstanding importance in a new country with such extensive territory barely explored. In this phase of aeronautics Canada is supassed by no country, having regard to the amount of work undertaken. As much as 80,000 square miles of territory have been mapped from the air in a single season, the carrying out of this task taking Canadian airmen into every section of the Dominion.

Rapidly the aeroplane has been adopted by nearly every branch of the government service. In British Columbia the Department of Agriculture has used it in connection with the investigation of plant and tree diseases, and in both Eastern and Western Canada it has played a part in warfare waged against black rust in grain crops. On the Pacific Coast the flying service lends assistance to the Department of Customs in its anti-smuggling efforts, carrying out continuous preventive patrols, and on the same coast fishery protection work is carried out by the plane.

Even the Indian Department has enlisted its aid in the transportation of treaty paying parties. One instance of this latter work illustrates the manner in which the air service has speeded up government operations. Each summer a treaty party leaves Ottawa to pay the Indians in the neighborhood of Moose Factory on Hudson's Bay. It used to be a very arduous trip of some fifty-two days, involving long stretches of canoeing and toilsome portages as well as subjection to the insect pests of that region. For the past few years the plane has been used to carry the party over the miles of wild country and it accomplishes the journey in comfort in twelve and one-half hours.

An instance of the extending utilization of aircraft for government work was the expedition which left Halifax last summer for Hudson Straits to spend fifteen months investigating ice and fog conditions in connection with the proposal to develop an ocean port on Hudson's Bay. A personnel of fifty men with six Fokker planes is established in three detachments at the straits pursuing their work. Flyers are making daily patrols under all kinds of Arctic weather conditions, the whole enterprise constituting one of the most intensive and hazardous flying jobs ever undertaken.

Such progress as has been made in commercial aviation has been similarly very largely in connection with the conservation and development of the country's natural resources and a considerable share of the work carried on has been by or for the provincial governments. A recent compilation shows that there are sixty-one civilian machines in good standing in Canada, these being owned and operated by twenty different organizations. The Ontario Provincial Air Service is the largest owner and operator of aircraft with nineteen airplanes of which fourteen are flying boats, one an air yacht, and four Moth machines. The Department of Marine and Fisheries owns and operates the second largest number of planes having in its possession seven craft. No other company or organization has more than six aircraft at present, one concern owning this number, one having five, two operating three machines, two having two, and the balance only one.

These small scattered units have nevertheless done an immensely valuable pioneer work of a multiplicity of kinds. They engage in forest protection for the provincial governments and lumber and pulp and paper companies, aerial survey and mapping of various natures, the transport of survey parties to otherwise inaccessible areas, and other economic work in addition to the ordinary joy flights, exhibition, and advertising. For the last three years a civilian pilot has proved an invaluable aid to the sealing expedition off the banks of Newfoundland. Some extraordinary and extremely hazardous expeditions have been undertaken by these free-lance flying men, notably a prospecting trip to the unexplored regions of Northern British Columbia and the Yukon and one to the unsurveyed and unpeopled tracts of the Mackenzie River basin in Northern British Columbia. The pioneer passenger services for which these enterprising airmen have been responsible, laying a foundation for future development, deserve special mention.

The Air Station at High River, Alberta, Canada.

The pioneer service was from the shore of Lake Temiskaming over miles of forest and lakeland into the newly discovered gold field of Rouya, Quebec, cutting down the five days of strenuous paddling to a comfortable journey of less than an hour. It carried passengers—promoters, engineers, prospectors, and entire mining crews,—every imaginable sort of freight and express, and in addition operated its own mail service for which a special

stamp was authorized. Authorities expressed the opinion that it set the early development of the new field ahead by at least two years, and it is still carrying on, though the railway has after years of travail reached the gold mining center. When gold was discovered in the Red Lake district of Ontario the successful operation of the Quebec service for so long naturally prompted the establishment of a similar one into the new camp and it is playing a big part in its development. After plans drawn up by the Manitoba Chamber of Mines the same company is operating a service into the mineral field of Northern Manitoba and has been given special authority to carry mail on both services.

The establishment of air mail routes through government contract with commercial organizations will be the next development in Canada. It has been definitely promised that this will be inaugurated in the spring of 1829, to be gradually extended into Eastern and Western Canada as conditions warrant. The first service is to be between Father Point on the St. Lawrence where the pilot boat goes out to meet incoming liners and the mail is taken off and Eastern Canadian centers. Arrangements are being made to have the mail sorted in the British Isles so that it can be readily transported to Quebec, Montreal, Ottawa, and Toronto, and the Royal Canadian Air Force is carrying out experimental work in the gulf of the St. Lawrence which will last throughout the winter to secure accurate information on flying conditions before any contracts are entered into.

Just as this issue of POPULAR AVIATION goes to press the news comes from Canada that the Canadian Government has authorized the purchase of $400,000 worth of airplanes in order to stimulate civil aviation. Two planes will be alloted to each city or town which establishes a flying club and agrees to maintain the planes.

Following this the air mail is likely to extend very rapidly throughout Canada. The government, for example, is having experimental flights made into posts in the far north inaccessible by dog team with a view to acquiring knowledge of actual working conditions on such routes, this with the idea of bringing them into frequent touch with civilization through dispatches of mail by air. Services between the United States and Canada will certainly come about soon. Success of the air mail in the United States has led the government of that country to look towards Canada as a field for the extension of its service. The postmaster-general at Washington has made it quite plain that he would welcome applications for air mail service between such points as Minneapolis or St. Paul and Winnipeg, where there is a very large exchange of mail over a comparatively short distance. An unofficial mail service has, in fact, been inaugurated between Fargo, North Dakota, and Winnipeg.

With the definite promise within a short time of air routes across Canada an aerial future of very great moment looms up for the Dominion. This winter contracts will be let for the construction at Montreal of a mooring mast for airships, to which Canada committed herself at the last Imperial Conference, the site for which was selected last summer by experts of the British Air Ministry who are at present working on designs. This, in the opinion of authorities, will be followed by the proviison of similar facilities on the Canadian Pacific coast as a further step in connecting the far-flung portions of the Empire by airship routes. With service from Great Britain and across Canada this will provide an all-red route to the Antipodes.

Canada may not have attracted the attention of the world in aerial affairs in the post-war period, but she has been developing soundly along the peculiar lines necessitated by her condition and laying a secure foundation for future development. At the same time she has been closely studying progress in other countries and has a wealth of experience to profit by today. All signs would indicate that the Dominion has arrived at a point where she is ready to make use of this and that a program of very important and elaborate aerial extension is to be inaugurated.

One of the outland air stations in far northern Ontario.

Thousands Make Flights

Two thousand persons, the largest number of persons who ever went into the air at any eastern aviation event, made flights during the air pageant which was held at Springfield, Mass., for two days prior to Labor Day and all through the holiday. The pageant was designed to arouse popular interest in aviation, and it certainly was a success from that standpoint, as well as a spectacle. This latter included an air parade, the ships circling in formation over Springfield, Chicopee and Holyoke. Another feature was a race won by Lieut. Robert Cobb of Boston, in his Hawk. Total attendance at the flying field reaching 50,000 for the three days, while many other thousands lined nearby highways and embankments while the stunts were being performed.

XUM

Pride of Detroit

[It really is]

WITH a view to making a round-the-world trip in the shortest time ever known, Edward F. Schlee and William F. Brock, left Harbor Grace, Newfoundland, on August 27 in a Stinson monoplane, Wright J-5 motor, and in less than 24 hours landed at the Croydon airport, near London, England, a distance of 2,350 miles.

As William Brock expressed it, the first leg of their flight consisted of six hours of battle against storms, and three hours of fight against sleep. The balance of the flight was a monotonous task of watching instruments and making constant mental corrections in order to keep the plane on its course.

As early as 5 o'clock in the morning the men had their first indication of land, getting a glimpse of Fastnet lighthouse, through the fog and murk. For about three hours they cruised about in an attempt to pick up a landmark, at one time passing over a harbor town which they could not identify. Locating a small town nearby, Mr. Schlee wrote a note asking the name of the town, and tossed it overboard in a paper bag weighted with an orange to the waiting crowd below. He was answered by seeing the name "Seaford" chalked in large letters on the pavement and the hoisting of the Union Jack. This confirmed their belief that they were in England, and justified their navigation. The finding of Croydon, after locating a railroad and making out the name on a station, was a comparatively simple matter.

The following morning, with clear weather ahead, the "Pride of Detroit," as Schlee's Stinson was christened, left for Munich, the second stage of the trip, a distance of about 500 miles. Following their plan of resting between each stage, the evening was spent in Munich and on the next day they left for Belgrade. At Belgrade a few hours' rest was taken before leaving for Constantinople, where they were to be the central figures of the crowning fete of the annual Turkish Aviation Week.

Turkey has become vitally interested in aviation and the Turkish Aviation League, which is the official organization having charge of the raising of funds for military and commercial planes, arranged a gala program for the reception of the two Americans.

The Pride of Detroit, the Stinson-Detroiter, at Harbor Grace, Newfoundland, just before the start.

Edward F. Schlee, president of the Wayco Oil Co., Detroit, who financed the trip.

The following route, with the approximate distances between the points, will show the course planned by Brock and Schlee.

Harbor Grace, Newfoundland...	Start
	Miles
London, England	2,400
Munich, Germany	480
Belgrade, Jugo-Slavia	510
Constantinople, Turkey	500
Aleppo, Syria	590
Bagdad, Iraq	485
Bendar Abbas, Persia	885
Kairachi, India	710
Allahabad, India	925
Calcutta, India	485
Rangoon, India	665
Tourane, Fr. Ind.-China	600
Hong Kong, China.....	890
Tokio, Japan	1,820
Sand Island, Midways	2,480
Honolulu, Hawaii	1,440
San Francisco, Calif.....	2,400
Cheyenne, Wyo.	925
Chicago, Ill.	865
Detroit, Mich.	257
Harbor Grace, Newfoundland..	1,550

The actual distance to be traveled to circle the globe by this route is estimated to be somewhere near 22,000 miles, and would require about 240 or more hours of actual flying time.

The route was covered without inci-

It took a line of "bobbies" to keep the crowds away from Schlee's Stinson-Detroiter, after it landed at Croydon.

Walter Brock (left) and Edward Schlee after arriving at Croydon on the first leg of their trip.

dent and according to schedule until the trip to Japan. A terrific typhoon was encountered and for the first time the globe-girdlers were compelled to make an unscheduled landing. There had been some exchange of correspondence with the Japanese government relative to permission for flying over certain portions of Japan. The imperial government had insisted that it would not permit certain of its military districts to be crossed in the air.

However, when Brock and Schlee were forced to descend in a Japanese government flying field every courtesy was extended to them and they were feted by both the military and the civilians.

By this time the United States was aroused because of the loss of many ocean flyers, and every possible pressure was brought to bear on the two men to abandon their attempt to cross the Pacific. Sand Island, in the Midway group, is really nothing more than a coral formation, and it would require the very best of navigation, coupled with good fortune and perfect weather to strike this spot. Messages poured into Japan beseeching the two men to give up the flight and to rest on their record of having flown two-thirds of the way around the world in record time.

It is to the credit of the sincerity of both of them and to the benefit of aviation itself that they finally yielded to the pressure of their friends. Weighing the personal glory of their success against the bad publicity that aviation would receive in the event of their

(*Continued on page* 61)

Hoover Field, Washington, D. C.

Potomac Flying Service

Some operators and many enthusiasts wonder if sight-seeing planes can pay. Read this article and you will see how one company, with good management, has grown steadily from its inception. Business getting methods have been developed and only the best equipment used.

THE Potomac Flying Service, Inc., was established in the spring of this year to provide commercial aviation service,—air taxi, sight-seeing, aerial photography and flying instruction for Washington and the vicinity. From a very small beginning in equipment and personnel, it has developed into the largest flying enterprise of its kind. Over 14,000 passengers have been carried on the sight-seeing flight over Washington, a demand service for cross-country work throughout the eastern part of the United States has been maintained, extensive aerial photography flying for the Fairchild company and the Robinson Studio of Front Royal, Virginia, has been performed and flying instruction has been provided for twenty-five selected students.

The company commenced operations in April with two new planes, a five-place cabin monoplane, built by the Berliner Aircraft, Inc., at College Park, Maryland, and a Waco Nine. Today the Potomac Flying Service operates in addition two Wacos and two Eaglerocks,—all purchased new. Initially two pilots and a mechanic constituted its operating personnel, whereas now the personnel required to conduct the business consists of five pilots, four mechanics, a publicity and business manager, a stenographic secretary, a bookkeeper, two solicitors, and a ticket collector or passenger escort. This staff is on the permanent pay-roll:—a force of laborers with teams and tractors, varying from two to ten, is also employed to maintain the landing field in good condition.

The company has established itself by adherence to conservative policies and sound business methods. No spectacular advertising has been resorted to, it has never held an air circus or stunts in an effort to attract passengers or publicity. Planes have never carried passengers except under favorable weather conditions and the passenger flights have been conducted without steep banking, steep climbs or glides. The company has had no accidents and due to the careful maintenance of its ships and the selection of its pilots and mechanics should continue this enviable record.

Ninety-five per cent of the passengers carried have been tourists, who undoubtedly have been attracted to the ride for its splendid sight-seeing panorama of the national capital, rather than for the sake of a thrill. The fact that the bulk of the company's revenue is drawn from the great tourist throng which constantly flows to Washington is indicative of the permanence of the enterprise.

Solicitation of business for the passenger flight has been made through direct contact,—no newspaper or magazine advertisements have been carried. Salaried solicitors make regular visits each day to the tourist hotels and principal points of interest,—particularly the Bureau of Engraving and Printing, Capitol, Museum, Washington Monument and Arlington National Cemetery. These men distribute leaflets descriptive of the sight-seeing flight amongst the thousands of visitors who flock to these points. Tickets and leaflets have also been placed in all the hotels. The lecturers on all the sight-seeing buses describe the company's activities on the tours which return from Arlington and Mount Vernon and stop to leave passengers at the field. Five hundred Washington taxicabs bear small advertising cards in the cabs. All the Washington newspapers have carried news stories either concerning the personnel, the students, or unusual cross-country or photographic jobs.

The Potomac Flying Services, Inc., was organized by Henry A. Berliner,

This Fairchild cabin monoplane carried 1,500 paid fares the first ten days it was operated.

its president, and Lowell S. Harding, its general manager. Mr. Berliner is an aeronautical engineer, graduate of Massachusetts Institute of Technology and Harvard University, president of the Washington Chapter of the National Aeronautic Association, and president of Berliner Aircraft, Inc. Mr. Harding is a pilot of ten years' experience, was a member of the 93rd Squadron, 3rd Pursuit Group, A. E. F., is now a lieutenant, U. S. Naval Reserve, after the war was manager of the Aerial Mail Field at Philadelphia, and thereafter has been extensively interested in commercial aviation. The Potomac Flying Service, Inc., has received the friendly cooperation of the aviation branches of the government departments and is indebted to them for much of its success.

This Business of Flying

BACK in the old days of cigar store Indians, long skirts and hard liquor, the boys did not have to seek excitement jumping the Atlantic or Pacific. They used a great deal of discretion exercising their "gasoline kites" just before the sun came up or was about to go down, provided the engine could be made to run, perfectly satisfied to stay in the air ten or twenty minutes, and an hour meant front page in every big town newspaper.

The only way to get a two-inch script in a big town sheet since Lindy, Chamberlain, Byrd, Maitland, Goebel and Brock have done their stuff is a non-stop around the world or a trip to the moon and return, so if ambitious aviators or avigators will concentrate a little effort on business building and sign up with some transport company using the money and effort selling and flying aircraft which the aforementioned avigators managed to sell the Dear Public, our progress from now on is assured.

The psychology of selling is much the same as a sermon—"Too much is plenty." Now that these boys have demonstrated the new "Air Sedans" and "Tri-motored Pullmans," let's take them off the race track and push them on the air-ways which Uncle Sam is spending his good money to mark and keep lighted.

By the time this is being read the National Air Races will be history, but a rare piece of judgment seems to have been used in selecting the location for the event this year. My only recollection of the N. A. R. is wading in mud, cursing a leaking umbrella or holding on to a fence post to keep from being blown away—in short, the flying conditions at these flying-fests have not been inviting to our Dear Public, much less the avigator, who after all doesn't count, because he flies anyway. Let's hope Spokane distributed plenty of sunshine, dry fields and balmy days that it is so noted for.

Every town seems to be interested in knowing what an airport should look like, and justly so, or their friends who travel among the clouds will have to pass them up and they will have to continue eating stale oysters shipped by train. Recently I found out what an airport should not look like. While driving along in a new "Sadallac," I saw a cloud of dust and thought a cattle stampede had taken place, so I pulled up to the side of a fine looking hangar which cost some one about $40,000 (or I don't know what it costs to lay brick or sling concrete), two bird-men who earned their wings before Uncle Sam began distributing them promiscuously, came up coughing and spitting dust and we started talking old times.

It seems that this is a municipal flying field and cinders are the easiest thing to fill and make runways with. Carloads of cinders had been used without a binder—the outcome, a cloud of dust which had recalled a stampede every time a machine took off or landed. This meant that engines were inhaling dust particles and grief will be the outcome for the operators. But the worst is that one of those old bird-men had just returned from an X-ray laboratory, where they had pictured his lungs and wanted to know what kind of cigarettes he inhaled to make a fire-brick lining in his lungs.

Serious business—this laying out of flying fields and expert advice should be secured before spending money on an airport, even if you don't own it. Moral: "Wait until the dust settles before you land."

"LEFT WING LOW."

Boston Fosters Aviation

A new committee has been appointed by the Boston Chamber of Commerce, to be known as the Committee on Aviation, whose outstanding functions are to be the development of airport facilities and traffic. Three of the members are actively engaged in aviation as reserve officers and the personnel is representative of all phases of aviation.

Arthur L. Richmond, of the State Street Trust Company, is chairman; with Charles Clark, of Raymond, Rich & Co., and Paul Ives, of the Equitable Life Assurance Society, making up the active aviation portion of the committee. Other members are James D. Brennan, W. Irving Bullard, Arthur Coombs, Thomas D. Cabot, Chester I. Campbell, William C. Chick, Howard S. Fahey, Col. James J. Fitzgerald, John Hays Hammond, Jr., Theodore G. Holcombe, George A. Loveland and Frank W. Merrick. Mr. Holcombe is president of the Boston Chapter of the National Aeronautic Association.

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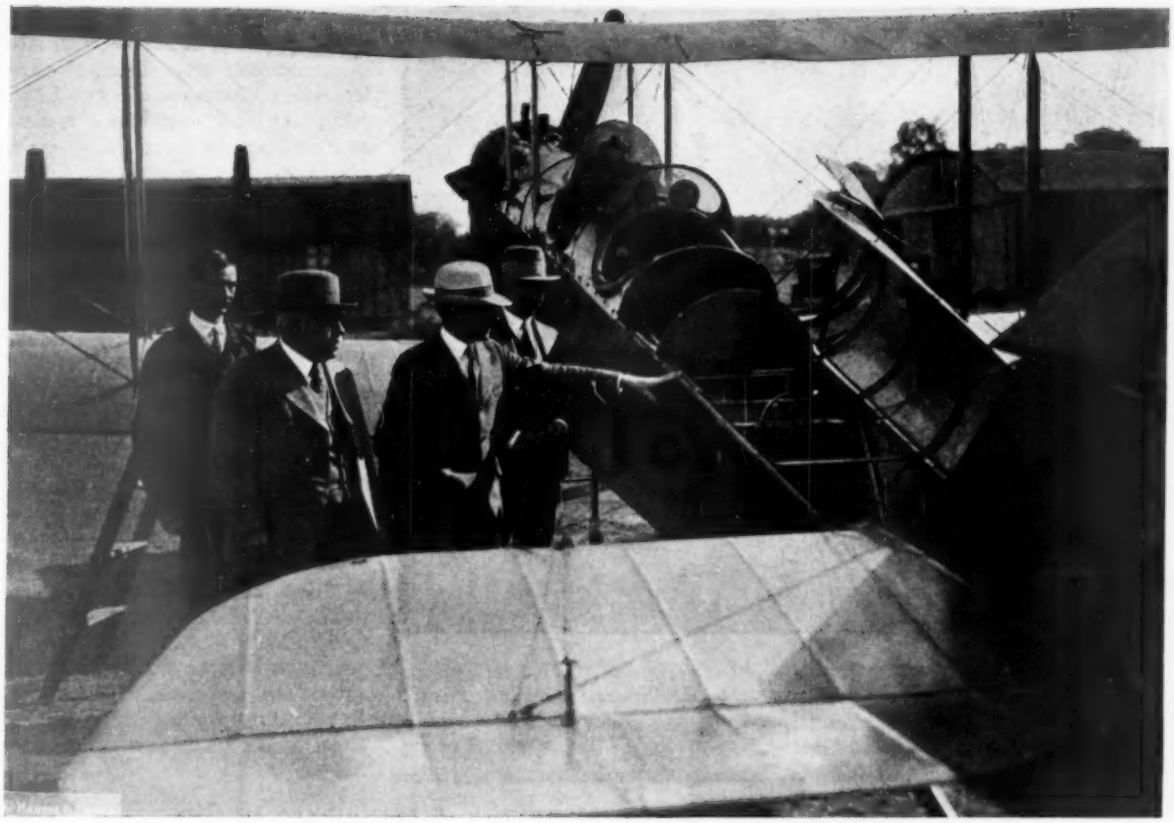


Guiding Airplanes by Radio Beacons

By S. R. Winters

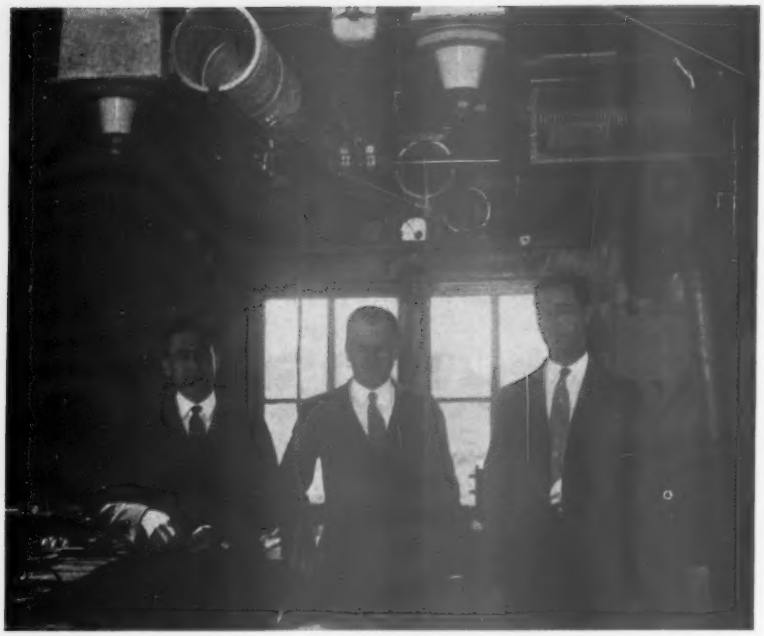
AT College Park, Maryland, where eight years ago the Air-Mail Service of the United States Post Office Department was inaugurated, there has just been dedicated the first aircraft radio beacon for the promotion of civil aviation. There, at this landing field, the first airplane laden with postal matter departed from the now time-worn hangars for New York City; today, this same spot marks the genesis of radio aids to air navigation.

The dedication of the College Park aircraft radio beacon station—the forerunner of 40 similar installations along the 8,234 miles of civil airways across the continent—was without formal exercises. The event, none the less impressive, was attended by Dr. George K. Burgess, Director of the Bureau of Standards; Dr. J. H. Dellinger, Chief of the Radio Laboratory, and the technical staff responsible for the erection of the station.

Appropriately signaling the completion of this safety aid to flying, Dr. Burgess congratulated Haraden Pratt, actively in charge of the work, while the latter was winging his way far above the field in the test airplane. Using a radio telephone, located in a wooden shack on the outskirts of the College Park aviation field, the Director of the Bureau of Standards, in communicating with the airplane in flight, said: "Mr. Pratt, I hear you very plainly. I am interested in what you are doing out here and am pleased to note that you have such a complete setup. Now, I must be going back to the Bureau to do some work. Good bye!"

Previously, Dr. Burgess had inspected the directive beacon for guiding aircraft in a zone of safety; he had donned a helmet and climbed aboard the radio-equipped flying craft; and then posed with Dr. Dellinger and the eight members of his technical staff for a photograph. The Director of the Bureau of Standards listened attentively to Dr. Dellinger as the latter related how the ignition system of this airplane had been shielded to minimize interference with radio communication; how a satisfactory receiving set, with but one control, had been installed on this craft; and how, by means of a visual indicator, aviators may be directed in a zone of safety by slender beams of radio when consulting a device on the instrument board of the airplane.

In the sense of being the genesis of radio aids to civilian aeronautics, the beacon station at College Park bears an analogy to the relation between the "Zero Milestone,' in Washington, D. C., to the public highway system. The latter is the starting point in reckoning the mileage of the network of highways. This beacon station not only marks the starting point in developing radio aids to air navigation



Left to right: F. W. Dunmore, Dr. Dellinger, Haraden Pratt, with the first installation equipment.

but the results of experiments now in progress will serve as a chart for erecting more than 40 other radio beacons along airways across the United States —for directing aircraft carrying passengers, postal matter, and express.

The directive beacons in transmitting a double-beam radio wave will set up a well-defined path or zone of safety for the airplane in flight. Established at intervals of 200 miles along the airways, in their functioning they are somewhat analogous to marine radio beacons or lighthouses for mariners, in that aviators are thus offered a guiding hand when enveloped in fog or obscured in darkness. This beacon transmits two directed radio beams, continuously sending on each a characteristic signal. The airplane, equipped with an ordinary radio receiving set, if traveling at equal distances from the lines set up by these radio beams will receive signals of equal intensity; off the well-defined path, there is an inequality of signals and the pilot corrects his course until the signals are again equalized.

The marker beacons, established at 25-mile intervals along the 8,234 miles of airways, will serve as mileposts to aviators, indicating the distance already traveled and how many more miles must be traversed before reaching their destination. These marker beacons do not overlap the function of the directive beacon since the former do not define the course of flight. Instead, these very low-power radio transmitting stations will flash a characteristic signal and upon being intercepted by the aviator he is automatically informed of his location. Extremely simple transmitting sets have been designed for this purpose and these mileposts along the air highways instead of conflicting with the function of the directive beacon will materially supplement its effectiveness.

Radio-telephone stations, located at 200-mile intervals along the more than 8,000 miles of civil airways, will serve as mediums for imparting weather forecasts, information about landing fields, and other navigational facts, to aircraft in flight. For this purpose, radio telephony is necessary since aviators are not usually trained in the technique of the Morse International telegraph code and are not, therefore, qualified telegraph operators. The use of the radio telephone on aircraft necessitates the adoption of specially armored cable for the engine ignition systems. Once the engines have been shielded to eliminate interference, conversations between pilots in flight and persons at ground radio stations may be effected at distances of 100 miles or more. Officials of the Bureau of Standards recently conducted experiments which form the basis of this estimate.

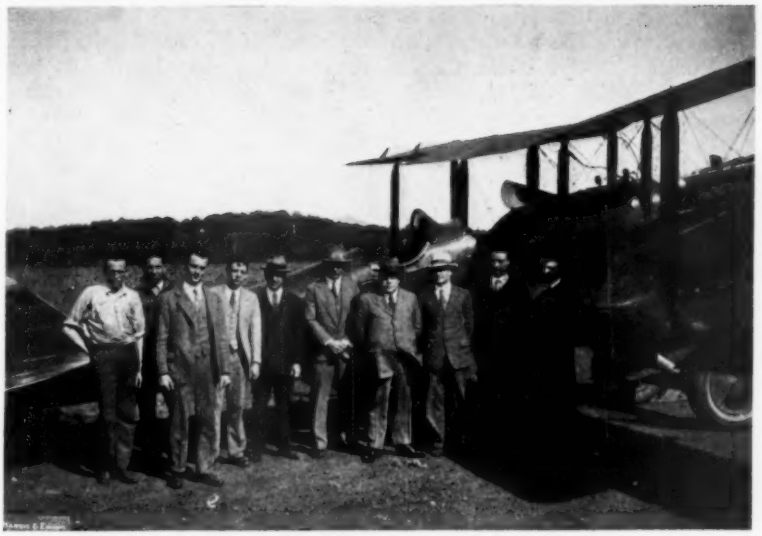
The aircraft radio beacon station at College Park, Maryland, is at once the genesis and model of all future radio aids to air navigation. There, under the direction of Dr. J. H. Dellinger, Chief of the Radio Laboratory of the Bureau of Standards, the first radio beacon was erected under authority of the United States Department of Commerce for the development of civilian aeronautics. A similar installation is being made by the Bureau at Bellefonte, Pennsylvania, and both of these beacon stations will be available for radio service to commercial air lines

Dr. Burgess and Edward M. Haight (pilot) in the College Park test airplane.

after July 1. The other four aircraft radio beacon stations available now or soon are: The station of the Army Air Corps at McCook Field, Dayton, Ohio; two stations of the Ford Motor Company, located respectively at Dearborn, Michigan, and Chicago; and a station installed by the General Electric Company at Hadley Field, New Brunswick, New Jersey. The commercial lines which these radio aids will serve are, respectively, the Pitcairn Company, operating the New York to Atlanta route, and the National Air Transport, Inc., operating the New York to Chicago route; and the Ford Motor Company, operating out of Detroit.

The model station at College Park includes a wooden tower, 70 feet high, painted a deep shade of yellow, with a flag at its apex. This towering lattice work is the main supporting structure for the two triangular loop antennas, from which double-beam radio waves are emitted for guiding aircraft. A radio room, 10x14 feet in dimension, containing the vacuum-tube transmitting set, the goniometer, and other necessary radio equipment, is located directly under this tower. The tower is approximately 10 feet in circumference at its base; gradually narrowing down to a peak at its apex. It extends over the top of the radio room so that there will not be an unbalanced electrical effect in the operation of the radio equipment in conjunction with the triangular loop-antenna.

Extending from the apex of this tower are four wires, running to four points of the compass, to distances of 150 feet. At the termini, the wires are connected to pulleys, which in turn are staked to posts by means of 200-pound weights. These antenna wires, forming a single-turn triangular loop, are run back to the radio room, the wires being supported 8 feet above the ground by three posts set in concrete. These so-called base wires are insulated from the posts by use of large glass insulators. The 200-pound weights at the termini of the base wires serve the purpose of slackening or tightening the antenna. The wires leading from the top of the tower appear, at first glance, to be guy wires but in reality they constitute the antenna system—the somewhat odd arrangement of two enormous loops crossed at right angles. It is a giant loop antenna when compared with our usual conception of loops; 1,256 feet of wire being utilized in constructing the two single-turn triangular loops. The College Park aircraft radio beacon station was constructed by Haraden Pratt, Francis W. Dunmore, and Carl B. Hempel of the Radio Laboratory of the Bureau of Standards. The radio aids to air navigation are being developed and perfected under the direction of Dr. J. H. Dellinger, Chief of the Radio Laboratory, who is leaving Washington soon for a three months' study of aids to air navigation in European countries. The Aeronautics Branch of the Department of Commerce is vested with the work of establishing radio beacon stations, a step of far-reaching significance.



The technical staff responsible for the construction of the first aircraft radio beacon for civil use.

Dr. Burgess listening to message from plane, Carl B. Hempel is tuning in, Dr. Dellinger in the background.

Preliminary to determining the equisignal zone of a directive radio beacon, the Bureau of Standards made ground tests with radio equipment installed on a motor truck. Fortunately, the equisignal line corresponded with the test road, thus facilitating the ease of making observations. At points 13, 21, 34, 38, and 51 miles distant from the transmitting station observations were made on crossroads running perpendicular to the equisignal line. The width of the zone at these points was found to be as follows: at 13 miles 360 feet, at 21 miles 400 feet, at 34 miles 400 feet, at 38 miles 450 feet, at 51 miles 500 feet. In measuring the width of the zone at these points the following method was used:

The signals were tuned in and the radio amplifier adjusted until the strength of the signals was of medium intensity. The motor truck was then driven back and forth on a line perpendicular to the equisignal line until the middle point was found; that is, there the intensities of the signals were equal. Then the truck was slowly driven north until the inequality of the signals became noticeable, this point being taken as one limit of the zone. The truck was then driven due south past the middle point of the zone until

the inequality of the signals again become noticeable. This point was taken as the other limit of the zone, the distance between the two limits as determined was taken as the width of the zone.

The equisignal zone thus determined was found to extend due west, not exceeding 500 feet in width at any point up to 50 miles from the transmitting station. "As the distance from the transmitting station increased," reports the Bureau of Standards, "the sharpness of the zone decreased, which necessitated closer observation to determine the exact width of the zone. It is interesting to note that observations could not be made close to overhead wires of any kind or in the lee of a high hill or wooded section. It was found that wires running parallel to and in the immediate vicinity of the equisignal zone have the effect of blending the two signals, distorting the position of the zone, and in many cases doubling the strength of both signals."

In an airplane test using a 200-foot trailing wire antenna the results were markedly different, owing to the direction and characteristics of the trailing wire. This test showed that signals were stronger when the airplane was flying away from the transmitting station than when flying toward it. This effect resulted in an apparent shifting of the equisignal zone in the direction of flight—when flying across the equisignal zone. The shift was greatest when the airplane was flown at right angles to the equisignal line. When flying to or from the transmitting coil the shift was not noticed.

The apparent displacement of the equisignal zone in the direction of flight was more marked the greater the altitude of flight. Twenty miles from the radio beacon station this shift at an altitude of 1,000 feet was found to be one mile; that is, an airplane flying in one direction across the equisignal zone found this zone displaced from its true position one mile in the direction of flight; an airplane flying in the opposite direction found the equisignal zone displaced one mile in the new direction of flight. At 2,000 feet this zone displacement appeared to be two miles, and at 3,000 feet it appeared to be four miles. At all altitudes, however, with the airplane in a stall so that the trailing antenna hung vertically or when the airplane was flying toward or away from the beacon station there was no zone displacement, the zone being located in the position determined by ground tests.

"The result of these tests," indicated the Bureau of Standards, "in which a light antenna weight and a 200-foot trailing wire were used, showed that the apparent shift in the equisignal zone was due entirely to the type of receiving antenna used and its inclination to the vertical. By using a short trailing wire with a much heavier weight the antenna hung in a nearly vertical position, thus eliminating the zone displacement effect to a large extent. Such an antenna is best suited for this type of reception, as any ambiguities arising from an apparent shift in the equisignal zone when the airplane is turned are practically overcome. The use of a coil antenna in place of a trailing wire is equally effective in this respect, but cannot be worked over as great a distance."

Of the future of this far-reaching system of guiding aircraft by slender beams of directed radio, Dr. Dellinger states:

"In carrying out its newly assigned responsibilities to provide aids to air navigation on the civil airways, the Department of Commerce has concluded that radio aids are indispensable. As the first step in establishing these radio aids the Bureau of Standards has been assigned certain research work and is setting up model installations.

"It has been established that the airways must be provided with a system of radio telephone transmitting stations and directive beacons at certain intervals. At smaller intervals between the directive beacon, probably every 25 miles, are to located the marker beacons. It is not yet certain whether the beacons will operate by means of an audible or a visual signal on the airplane, and the determination of this is one of the principal objects of the investigations now in progress.

Duluth-Minneapolis Line

THE Trump Airways, Inc., of Minneapolis are operating a combined passenger and commercial service between Duluth and the Twin Cities.

Cecil R. (Sinnie) Sinclair, chief pilot, has recently been associated with the Stout Metal Airplane Co., division of Ford Motor Co. and was assistant in charge of the Ford Airport, under Major Schroeder, for fifteen months.

A Buhl Airsedan, powered with a Wright Whirlwind, with a carrying capacity of four passengers and pilot covers the distance in a hour and a half.

Additional planes of similar design will be added as the daily trips being made at present become insufficient for the increase in traffic.

As a part of their aim to be up to the latest in aviation, the Trump Airways is including in the fare between the two points, free transportation between a down-town hotel and the flying field in the respective cities.

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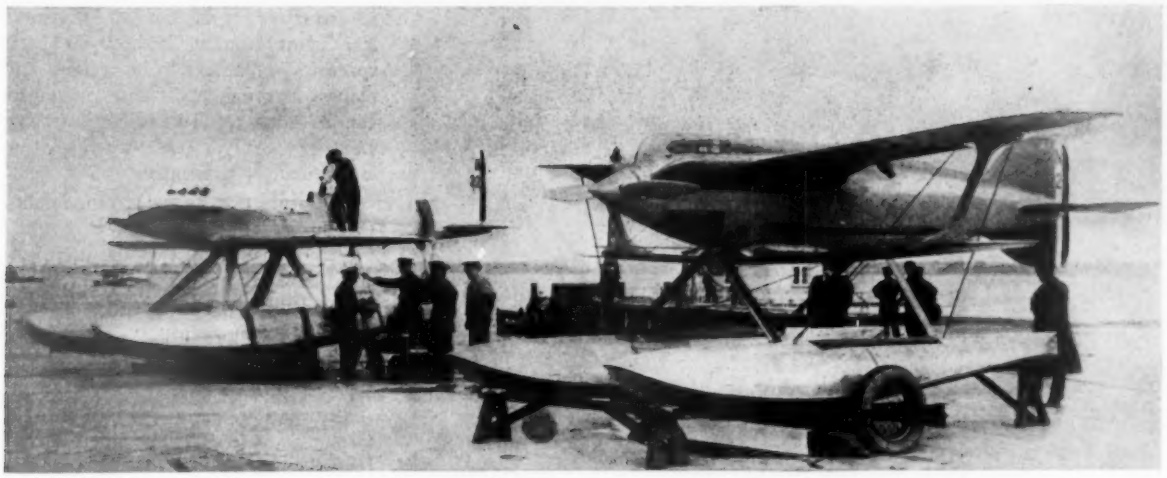


New World Records for Speed

ALL world records for speed were broken at Venice, Italy, on September 26, with the winning of the Schneider trophy by Flight Lieutenant S. N. Webster of the British team.

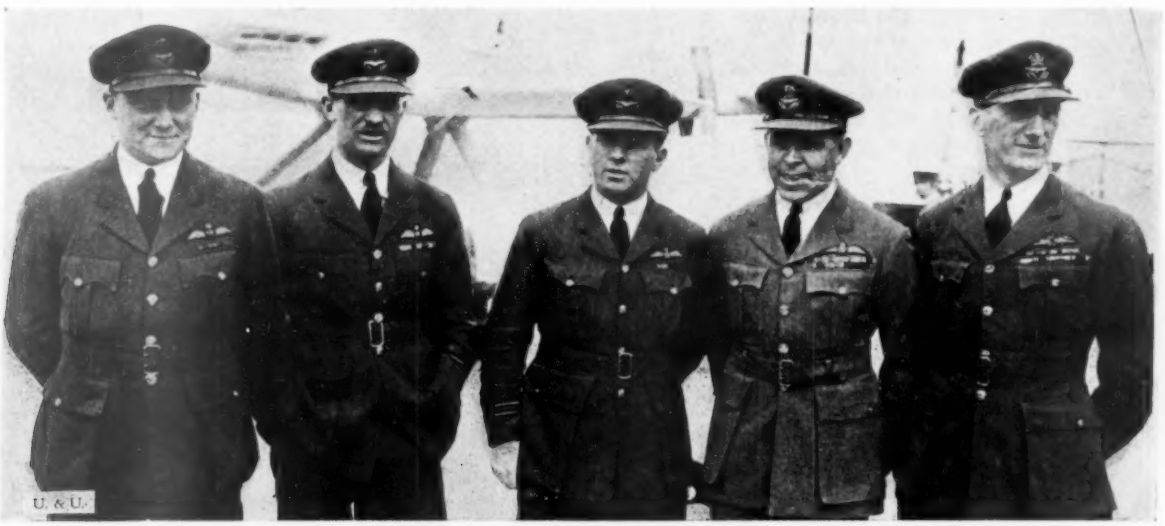
Webster flew his Napier motored seaplane over the measured course at a speed of 281.488 miles per hour, which is close to four and seven-tenths miles per minute. Some idea of the tremendous speed can be gained by reducing the record to feet per second,—a mere matter of approximately 413 feet per second. One of the fastest laps was at the rate of 296 miles per hour or 434 feet per second.

All three of the Italian entries in the cup races were forced down on account of motor trouble. Major de Bernardi, who won the cup last year from the United States, landed during the first lap and the other two, Captain Ferrarin and Captain Guazzetti, shortly after. None of the Italians made a lap in better than 256 miles per hour.

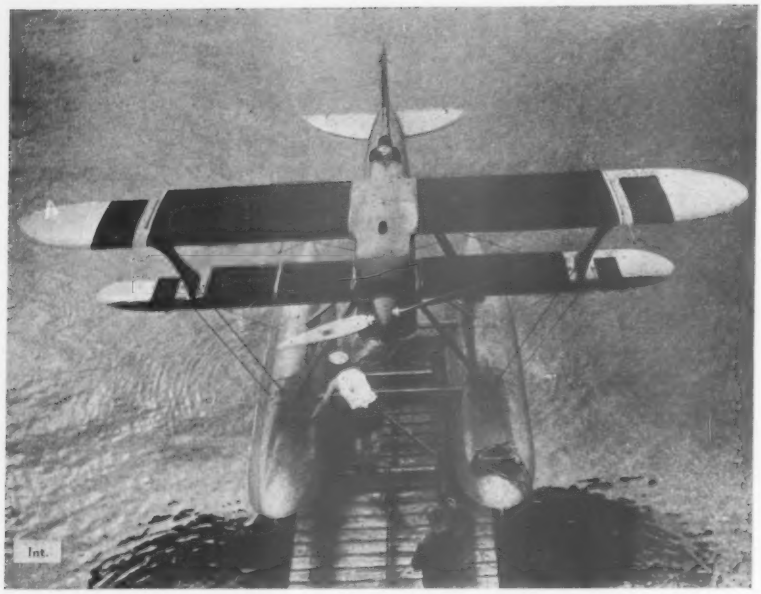
Flight Lieut. O. E. Worsley, of the English team, finished second, with an average of 272.912 miles per hour. Lieut. Kinkead of the British team dropped out after the third lap.

The United States did not participate in the races this year. Lieutenant Alford J. Williams was the only entrant from this country, but he was unable to complete the preliminary tests on the seaplane with which he hoped to capture the trophy. Lieut. Williams had a specially constructed plane, powered with a 24-cylinder Packard engine. Numerous setbacks prevented him from finishing his flying tests in time to have the plane shipped to Italy.

Last year the cup was won by Major de Bernardi, who set a new speed record of 246.496 miles per hour, better than four and a tenth miles per hour. Lieut. F. Schilt of the United States Navy was second with an average speed of 231.363 miles per hour.



The British team (left to right): Flying Officer Scholfield, Lieutenants Worsley, Webster, Kinkead and Squadron Leader Slatter.



Lieut. Alford Williams' Flying Engine on the ways at Port Washington.

In accordance with the regulations governing the races, the country winning the cup holds the races the succeeding year, and for that reason the races were this year held in Italy.

The Schneider tropy was donated in 1912 by Jacques Schneider, a French amateur sportsman and aviator. The purpose of offering the trophy was the encouragement of naval aviation. The first race was held at Monaco in 1913 and the cup was won by Maurice Prevert, of Farnce, who flew 72 miles per hour. In 1923 and 1925 the trophy was won by the United States.

Planes entered in the races are specially built for the purpose and are designed solely for speed and ability to make the turns. They are streamlined to the last degree, and there is no excess size. Cockpits are so small that they just fit the body of the pilot. A study of the photos of the winning British ships will indicate how different these seaplanes are from the ordinary commercial and sport planes.

Gold Freighting Line

Probably the most interesting projected foreign line is the one being worked out at present by Alan Cobham Aviation, Ltd., for the purpose of carrying gold bullion and diamonds from South Africa to London.

Gold and diamonds represent two-thirds of the total exports of South Africa, and the output amounts to nearly seven and a half tons per week, as far as the gold is concerned. Of this about three quarters of the total is sent to London, while the balance goes to India. As freight is charged on gold in proportion to its value, rather than its weight, gold carrying offers an excellent field to the airplane. At present freight rates on gold shipments from South Africa amount to about $2,000 per ton.

Another reason why gold carrying is attractive from the air transport standpoint is that it occupies little space in proportion to its weight, and planes carrying mail and passengers can be filled to their weight carrying capacity easily, without displacing either mail or passengers.

A feature that appeals to the miners, that is not at first obvious to the uninitiated, is the fact that the use of air transport will save the miners nearly a half million dollars yearly in interest, as the air transport will get the gold into circulation in much less time than ocean freight.

Insurance rates on gold shipped by airplane are lower than when carried by rail or ship. The risk of total loss is somewhat greater, but the risk of theft is sufficiently less to effect a saving when the entire rate is considered.

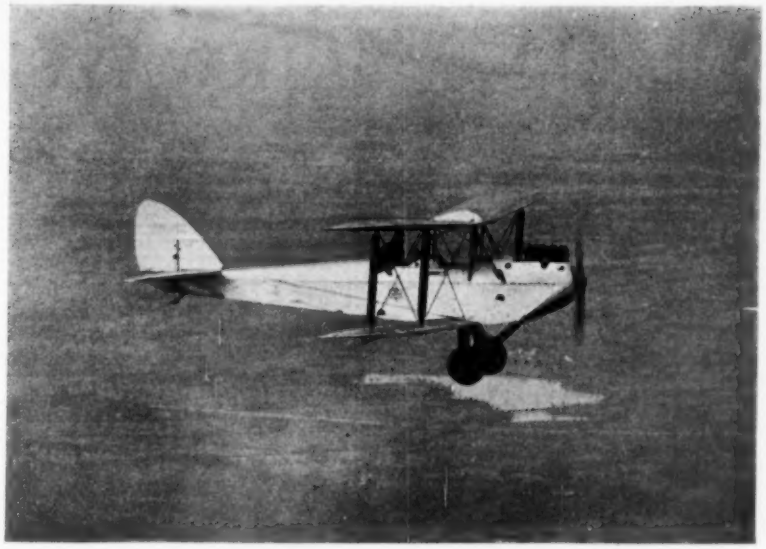
Sir Alan Cobham and his associate, Col. Warwick Wright, are working on the various political and other obstacles which must be overcome before this air line can become a reality. They have the support of influential men in the mining industry who are under no illusions about aircraft, but who honestly believe that aviation has advanced to the point where it will pay business to take it up.

The projected line will probably run from Johnnesburg to Cairo, and from that point using the regular traffic lanes to London and to India.

The DeHaviland Moth plane "Johannesburg," which Captain Bentley flew 7,000 miles, from London to South Africa.

A Foreign Plane for Clubs

By Lloyd S. Graham



Irwin's Moth in flight with the pilot standing in the cockpit with his hands off the controls.

The local aero clubs now forming will be interested in the story of the "Moth" —a popular plane among the English Light Plane Clubs. The design is nearly ideal for the purpose required, and some of the English statistics on upkeep are so low they look wrong.

WHEN Leslie L. Irvin, chief engineer of the Irving Air Chute Co., Buffalo, N. Y., recently returned from his English factory he brought with him to the Buffalo Airport an English plane which has attracted much interest among pilots passing through the port.

When Col. Charles L. Lindbergh was in Buffalo on his country-wide tour he looked the plane over and wanted to fly it, but was too busy. He contented himself with saying that he was coming back to Buffalo after his tour and wanted a chance to fly it then.

We have had cameras which would fold up and go into vest-pockets for many years, but this plane of Mr. Irvin's is the first plane at the Buffalo Airport which can be folded up and run into an ordinary garage. Moreover the folding and unfolding can be done in a couple of minutes.

For some time Mr. Irvin has used the plane in England, where he has been looking after the operations of his company. So far as he knows, his plane is the first and only one of its kind to be actually used in flying on this side of the Atlantic.

A word about Mr. Irvin himself by way of introduction to those who don't know him: He started his air career when he was fourteen years old by parachute jumping in California. Since then he has been in the air much of the time making literally hundreds of parachute jumps. He has ridden in and driven all sorts of planes. Luckily all of his jumps have been premeditated, that is, in the interests of tests and for exhibition purposes and not from necessity.

This plane is known as the DeHaviland "Moth" and Mr. Irvin says it is used chiefly in England by private owners and also in the light plane clubs which are subsidized by the government for the training of civilian flyers.

The best thing about the plane, from Mr. Irvin's standpoint, is that it has a "heavy" feel in the air. That is, it feels like a much heavier plane and does not have the delicate "light" feel to the pilot which is common in most light planes.

The length of the "Moth" is twenty-three feet and a half, while the wing span is twenty-nine feet. However, these wings are readily folded up to a width of nine feet and eight inches. It stands about eight and one-half feet off the ground. The weight of the plane, without passengers, fuel or oil, is a trifle more than 800 pounds. There are cockpits for one pilot and one passenger with dual controls. In the air with two persons, oil and gasoline the weight is about 1,265 pounds, figuring the weight of each passenger at 160 pounds.

The power plant in the "Moth" is a four-cylinder, air-cooled "Cirrus." Mr. Irvin says that this motor produces a rate of climb of more than 600 feet per minute near sea level with a ceiling of 15,000 feet. Ordinary cruising speed is 75 miles per hour, but he has been able to crowd it on occasion up to 95 miles per hour. The motor is rated at 30 to 80 h. p.

In detail Mr. Irvin says that the motor has a stroke of 130 mm. and a bore of 110 mm. The cylinders are of cast iron and fitted with aluminum alloy heads. There are the usual cooling fins. Valves are of the overhead rocker type. Pistons are aluminum alloy. Piston rings are cast iron. Connecting rods are Duralumin stampings of H section, the bearing at the big end being white metal in a bronze shell. There is a five-bearing crankshaft, front and rear bearings being roller and the other three bearings white metal in phosphor bronze shells. The propellor is mounted directly on the crankshaft. There is a force-feed lubrication by means of an oil pump located in the bottom of the oil base. There is dual ignition with two magnetos and two sets of spark plugs. There is a dual Zenith carburetor with altitude control.

The gasoline tank is above the cockpits, forming the center and stationary section of the upper wing. It holds fifteen gallons, English measure, and gives the plane a cruising radius of about 300 miles. Oil consumption is figured about one pint an hour.

Mr. Irvin says that one of the chief uses of the "Moth" in England is for training civilians in the light aeroplane

(*Continued on page* 64)

AIRWAYS

Air-Mail Schedules — **Air Travel Information** — *Air-Express Schedules*

†New York to — NATIONAL AIR TRANSPORT — Chicago

Westbound	Close P. O. Day	Close P. O. Nite	Leave Day	Leave Nite	Phone
New York, N. Y.	10:00	6:30	11:00	8:00	Lexington 8044
New Brunswick, N. J.			12:15	9:35	
Cleveland, Ohio	2:30	12:00	3:35	1:30	Lakewood 9006
Chicago, Ill.			7:00	5:35	Harrison 8234

Eastbound	Close P. O. Day	Close P. O. Nite	Leave Day	Leave Nite	Phone
Chicago, Ill.	6:30	6:30	8:00	8:00	Harrison 8234
Cleveland, Ohio			11:00	12:15	Lakewood 9006
News Brunswick, N. J.			4:45	4:45	
New York, N. Y.			7:00	6:15	Lexington 8044

*†Chicago to — BOEING AIR TRANSPORT — San Francisco, 1943 Miles

Westbound	Close P. O.	Leave	Phone
Chicago	6:30	7:50	Wabash 8084
Iowa City, Iowa	8:40	9:40	425
Des Moines, Iowa			Maple 707W
Omaha, Nebr.	10:30	12:35	Atlantic 9301
North Platte, Nebr.		2:00	29
Cheyenne, Wyo.	3:30	4:45	656
Rock Springs, Wyo.	6:30	7:05	415J
Salt Lake City, Utah	9:00	10:20	Wasatch 5569-3321
Elko, Nev.	10:45	11:15	1553
Reno, Nev.	1:00	1:45	195
Sacramento, Calif.		2:45	
San Francisco, Calif.		4:30	Kerney 2041

Eastbound	Close P. O.	Leave	Phone
San Francisco, Calif.	6:05	7:00	Kearny 2041
Sacramento, Calif.	8:15	9:15	
Reno, Nev.	10:00	10:30	195
Elko, Nev.	12:15	12:40	1553
Salt Lake City, Utah	3:00	4:05	Wasatch 5569-3321
Rock Springs, Wyo.			
Cheyenne, Wyo.	7:30	8:00	656
North Platte, Nebr.			
Omaha, Nebr.	10:30	12:45	Atlantic 9301
Des Moines, Iowa		1:45 Deliver	Maple 707W
Iowa City, Iowa			
Chicago, Ill.		5:45	Hemlock 8180

*†Rt. Cam-3, Chicago to — NATIONAL AIR TRANSPORT — Dallas, 1003 Miles

Southbound	Close P. O.	Leave	Phone
Chicago, Ill.	3:45	5:45	Harrison 8234
Moline, Ill.	6:50	7:20	Moline 738
St. Joseph, Mo.	10:10	10:20	St. Joe-6-0349
Kansas City, Mo.	10:50	11:18	Leeds 1090
Wichita, Kans.	12:45	1:18	Market 6185
Ponsa City, Okla.	1:40	2:05	
Oklahoma City, Okla.	2:00	3:05	Walnut 4214
Fort Worth, Texas	4:00	5:15	Prospect 2169
Dallas, Texas		5:35	5-7113

Northbound	Close P. O.	Leave	Phone
Dallas, Texas	7:00	7:45	5-7113
Fort Worth, Texas	7:00	8:15	Prospect 2169
Oklahoma City, Okla.	9:00	10:10	Walnut 4214
Ponsa City, Okla.	10:40	11:05	Market 6185
Wichita, Kans.	11:15	11:57	
Kansas City, Mo.	12:15	2:05	Leeds 1090
St. Joseph, Mo.	2:17	2:40	St. Jos. 6-0349
Moline, Ill.	4.00	5:15	Moline 738
Chicago, Ill.	6:30	7:20	Harrison 8234

*†Rt. Cam-2, Chicago to — ROBERTSON AIRCRAFT CO. — St. Louis, 278 Miles

Southbound	Close P. O.	Leave	Phone
Chicago, Ill.		5:50	Maywood 4010
Peoria, Ill.		7:25	
Springfield, Ill.		8:15	
St. Louis, Mo.		9:15	Avery 2725

Northbound	Close P. O.	Leave	Phone
St. Louis, Mo.	3:30	4:15	Avery 2725
Springfield, Ill.		5:20	
Peoria, Ill.		6:10	
Chicago, Ill.		7:30	

Rt. Cam-4, Salt Lake City to — WESTERN AIR EXPRESS — Los Angeles, 600 Miles

Westbound	Close P. O.	Leave	Phone
Salt Lake City, Utah		9:10	
Las Vegas, Nev.		2:25	
Los Angeles, Calif.		5:25	Trinity 6754

Eastbound	Close P. O.	Leave	Phone
Los Angeles, Calif.	6:30	7:35	Trinity 6754
Las Vegas, Nev.		10:40	
Salt Lake City, Utah		3:20	

Rt. Cam-5, Elko to — WALTER T. VARNEY — Pasco, 435 Miles

Westbound	Close P. O.	Leave	Phone
Elko, Nev.		11:30	
Boise, Ida.		1:15	
Pasco, Wash.		4:35	

Eastbound	Close P. O.	Leave	Phone
Pasco, Wash.		6:00	
Boise, Ida.		9:20	
Elko, Nev.		12:30	

Rt.-Cam-8, Seattle to — PACIFIC AIR TRANSPORT — Los Angeles, 1,099 Miles

Southbound	Close P. O.	Leave	Phone
Seattle, Wash.		11:45	
Vancouver, Wash.			
Portland, Ore.		7:00	
Medford, Ore.		9:30	
San Francisco, Calif.		1:15	
Fresno, Calif.		3:15	
Bakersfield, Calif.		4:45	
Los Angeles, Calif.		6:15	Vermont 4279

Northbound	Close P. O.	Leave	Phone
Los Angeles, Calif.	11:00	12:01	Vermont 4279
Bakersfield, Calif.		1:45	
Fresno, Calif.		3:30	
San Francisco, Calif.		5:30	
Medford, Ore.		9:30	
Portland, Ore.			
Vancouver, Wash.		12:00	
Seattle, Wash.		2:00	

AIRWAYS—Continued

Rt. Cam-12, Cheyenne to — COLORADO AIRWAYS — Pueblo, 199 Miles

Southbound	Close P. O.	Leave	Phone	Northbound	Close P. O.	Leave	Phone
Cheyenne, Wyo.		5:30		Pueblo, Colo.		4:00	
Denver, Colo.		6:55		Colorado Springs, Colo.		4:50	
Colorado Springs, Colo.		7:50		Denver, Colo.		6:00	
Pueblo, Colo.		8:30		Cheyenne, Wyo.		7:30	

*†Rt. Cam-9, Chicago to — NORTHWEST AIRWAYS — Minneapolis, 377 Miles

Westbound	Close P. O.	Leave	Phone	Eastbound	Close P. O.	Leave	Phone
Chicago, Ill.		5:50		Minneapolis, Minn.	1:30	2:30	
Milwaukee, Wis.		6:50		St. Paul, Minn.	2:10	2:40	Cedar 5693
La Crosse, Wis.		9:30		La Crosse, Wis.	3:30	4:00	
St. Paul, Minn.		11:30	Cedar 5693	Milwaukee, Wis.	5:15	6:00	
Minneapolis, Minn.		11:40		Chicago, Ill.		7:00	

Rt. Cam-1, Boston to — COLONIAL AIR TRANSPORT — New York, 192 Miles

Southbound	Close P. O.	Leave	Phone	Northbound	Close P. O.	Leave	Phone
Boston, Mass.	5:15	6:15		New York, N. Y.	3:00	6:00	Ashland 7750
Hartford, Conn.	6:15	7:35		Hartford, Conn.		6:35	
New York, N. Y. (Hadley Field)		8:15	Ashland 7750	Boston, Mass.		7:50	

Rt. Cam-6, Detroit to — FORD AIRLINES — Cleveland, 91 Miles

Southbound	Close P. O.	Leave	Phone	Northbound	Close P. O.	Leave	Phone
Detroit, Mich.	9:50	10:40		Cleveland, Ohio	3:30	4:30	
Cleveland, Ohio		12:10		Detroit, Mich.		6:00	

*Rt. Cam-7, Detroit to — FORD AIRLINES — Chicago, 237 Miles

Westbound	Close P. O.	Leave	Phone	Eastbound	Close P. O.	Leave	Phone
Detroit, Mich. (Central Time)	2:25	3:15		Chicago, Ill.	7:55	9:30	
Chicago, Ill.		6:00		Detroit, Mich.		12:00	

*Rt.-Cam-11, Cleveland to — CLIFFORD BALL AIRLINE — Pittsburgh, 123 Miles

Southbound	Close P. O.	Leave	Phone	Northbound	Close P. O.	Leave	Phone
Cleveland, Ohio		12:15		Pittsburgh, Pa.		2:30	
Youngstown, Ohio		1:00		Youngstown, Ohio		3:15	
Pittsburgh, Pa.		1:45		Cleveland, Ohio		4:00	

† Express
***† Express and Passenger**
Light face type—A. M.
Bold face type—P. M.

Time used is local time, whether Eastern, Central, Mountain or Pacific.

Incomplete data will be filled in as rapidly as authentic information can be compiled.

The above schedules of airways information, while carefully compiled, are not guaranteed to be correct, but every effort and precaution is used and will be, from now on, in keeping this schedule up to date. It is proposed, from month to month, to correct and incorporate such further information as may be necessary in keeping pace with the air transport progress of the United States Air Lines.

An attempt has been made to print a schedule which is readable and may be understood by all who have use for air transport, whether air mail, passenger, or express service and is published for the purpose of promoting air transportation and educating our readers so that they may intelligently answer questions regarding aircraft operations when such information is requested.

The present air transport companies now operating and listed above, are primarily trunk lines, but there is a new phase of air transport, heretofore seemingly neglected, springing up throughout the country, namely, Aerial Taxi Service. We hope, in the near future, to be able to print authoritative information on this class of service wherever it prevails with the proper kind of equipment, so that at any time anyone seeking air travel information may refer to POPULAR AVIATION and there find the answer.

Passenger service heretofore neglected by the air transport companies is now available from New York to Boston over the Colonial airways, Chicago to Dallas and intermediate points via National Air Transport, Chicago to San Francisco and intermediate points over the Boeing Airways and from Salt Lake City to Los Angeles over the Western Air Express and from Los Angeles to Seattle via the Pacific Air Express. Phone numbers have been given wherever possible so that people desiring information regarding air travel and transport between any two particular places can be secured through these offices.

We would appreciate comments from our readers as to how we can further make this schedule better suited for their particular needs, as it is the ambition of POPULAR AVIATION to assist in bringing the industry closer to the market.

Current Comment

The Time Tables

We hope that our readers will feel like celebrating with us the first printing of a combined reference time table of the operating air lines of the United States. To our knowledge this handy reference time table has never made its appearance until this month. As time goes on we hope to add many more lines to this list, until the country is covered with a network of air transport companies. Future tables will contain fuller information, and with the co-operation of the various transport companies and taxi-services, we hope that these pages will serve as a constant reminder to our thousands of fair-minded readers that Air Transport is more than a reality—it has taken its place as a great business.

Youth and Flying

It is easy to see why flying appeals to the youth. Youth with its characteristic enthusiasm often sees only the surface facts about whatever is of interest. We can say that of the many, many letters we have received from young men anxious to get into aviation "in any way," that not one in ten gives a thought to any other branch of aviation but piloting. Aviation is transportation (we seem to be always insisting upon that) and like railroad transportation, there are other positions open besides that of the engineers of our crack trains. Some bright youths are going to discover that expert air traffic movers, salesmen for air service, and all the others needed to keep a great business moving will be in as great demand as pilots. But meanwhile the pilot gets the popularity vote.

The Schneider Trophy

The winning of the Schneider Trophy by the English team is simply a demonstration of the value of team work in going after a coveted record. It is not particularly to the credit of this country that for months no organization could be found to back a team from the United States. Fortunately a few were finally interested and with the co-operation of the Packard Motor Car Company Lieut. Williams was supplied with a plane and one of the two X-type Liberties built. Unfortunately the tests forced the Lieutenant to make certain changes in design which could not be carried out in time for him to compete.

Competition in such an event requires months of preparation, financial backing and an organization of sorts. Abroad, the teams are practically representative of the competing countries' navies. Technically they have no connection, but as a matter of fact, the teams are financed by their navies, taken to the races by warships, and have back of them the full facilities of the naval organization. We need the same viewpoint in this country. It is fully possible that until we make such an organized effort we shall not recover this trophy.

Straws and the Wind

Just this last month we have had callers who have announced their intention of buying planes. We mean immediate intention, and not some vague future interest. The business of these men is some indication as to the uses of the air as transportation. One is a printer, located so far from Chicago that he has been handicapped in offering his service in the great market of the city. A cabin plane will enable him to serve his customers with the speed they require. For him it has eliminated distance.

Another is a small town manufacturer, whose business in a small town on one railroad, has grown until he has been faced many times with the problem of quick service to his dealers. Fortunately for him his product is of little bulk and valuable. He will make direct shipments to nearby cities in his own plane, and will make connections with air service in a nearby large city for his distant shipments. For him the airplane has eliminated the necessity of a costly moving of his business to keep pace with service.

Still another is a salesman, whose business is so scattered that he calls on but one concern in each large city of four states. It is his belief after a careful investigation that the airplane he will buy will eliminate wasted time.

We haven't gone into the motives of the others. The three are enough. Curiously, not one of them had considered the move six months ago.

Local Aero Clubs

Probably more interest has been evidenced in local aero clubs than in any other one phase of aviation at the present moment. Here is a development that we have directly borrowed from England, where there are many thriving clubs supported by local enthusiasts with the help of the government. The aero club offers the one quickest way for the largest number of people to learn flight. Such clubs can never take the place of schools, as the instruc-

XUM

Current Comment

tion given is purely for amateur flight, but with the rapid growth of clubs, scattered in different parts of the country, we are obtaining a large body of flyers capable of being rapidly trained in the corollaries of flying if the need should ever arise.

With locally supported clubs owning planes for the members to fly, and hiring competent instructors for teaching the members, it is not hard to vision a new market for planes and a new outlet for accessories that does not exist today. The plane that is beyond the finances of the individual becomes an easy possibility to a group of ten, fifteen or twenty. In fact, the industry should welcome the appearance of the clubs, which will, in a short time, become a factor of importance from a sales standpoint.

Thanks, Men

The abandonment of the attempt to make a record flight around the world cost Brock and Schlee something. They had expended a world of effort and energy to make this flight, and gave it up only after a deluge of cablegrams from their friends. It is impossible to doubt the courage of the men who faced the storms of the North Atlantic and the China Sea. These two men are vitally interested in the future of aviation and gave up this attempt so that no further damage might be done to the cause in the event of failure.

It is noteworthy that this extended flight was made without military or naval help and without the assistance of any great organization. It was just such a ride, on a larger scale, as people take when they decide to motor from Chicago to Miami. They took advantage of such facilities as could be found along the route. Just as the tourist takes advantage of the garages and service stations along his selected route, and plans his route accordingly, just so did these men plan their journey. With one jump excepted, they flew no longer each day than a man would drive an automobile. The whole thing gives a picture of the progress of aviation and the increase of facilities.

Our New Feature

With this month's issue, POPULAR AVIATION starts what we believe to be an innovation in magazine make-up. There are certain departments of POPULAR AVIATION which many of our readers tell us they wish to preserve in some permanent form. To that end we are arranging the magazine so that certain pages, containing definite data of future value, can be preserved in loose leaf form. All the reader will have to do is to cut the page carefully from the magazine, punch where indicated and file in an ordinary ring binder.

A new department starts this issue, and will be continued in future numbers of POPULAR AVIATION. It consists of full-page specifications of two different makes and types of planes. Every month two other sets of specifications, with photographs, will be published until the field is covered. When new models or designs replace older ships correction pages will be published, so that every reader who desires to have a complex index of the various ships in uniform shape will only have to clip this page and preserve it in a ring binder.

The scale drawings for the Model Department will also be published in this same fashion. The A B C of Aviation will be condensed and printed so that it can be saved in the same manner.

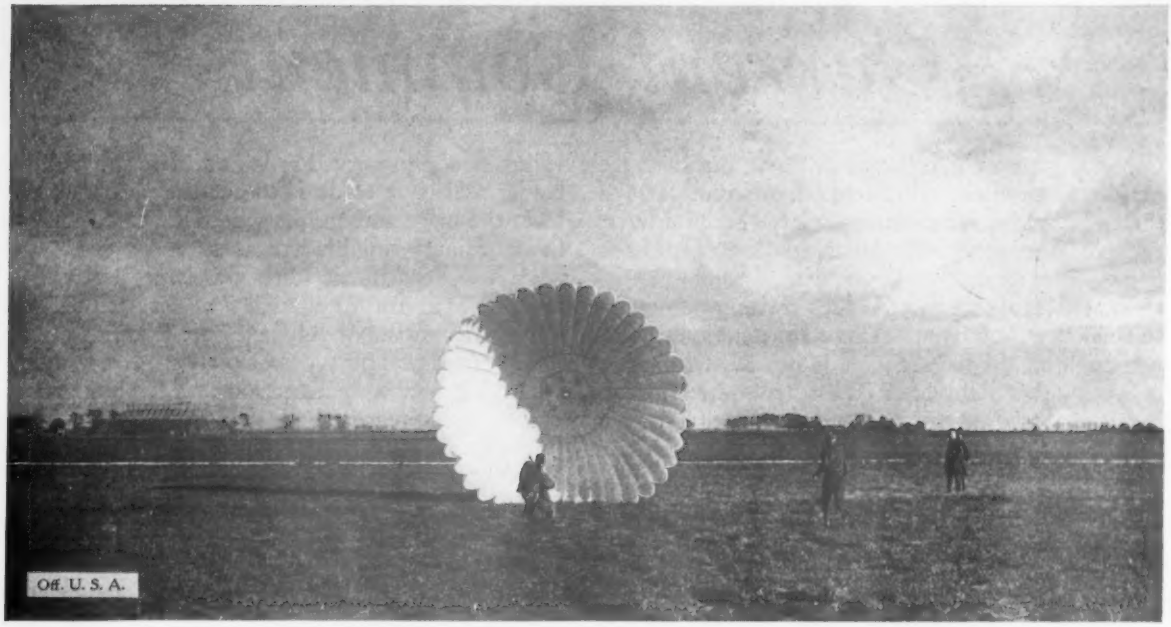
We have to thank the readers who have been so generous with their suggestions and so helpful in their criticisms for the inception of this idea. Is it too much to ask them to let us know what they think of this effort?

Our Letter Bag

The correspondence of POPULAR AVIATION is growing to a point where it has become a problem. Any editor is glad to hear from his readers; it is through their letters that he keeps informed as to their likes and dislikes. POPULAR AVIATION will continue to answer as many questions as possible but asks that readers be patient if replies are not immediately forthcoming.

The National Races

We do not know who selected the equinoctial period as the time of the National Air Races, but we believe that it added an extra hazard that was not justified. Aviation requires a knowledge of meteorology, and the selection of the autumnal equinox as the time of the races brings up the question as to how much practical knowledge of weather conditions exists. We realize that we are on somewhat shaky ground, scientifically, because the relation of the fall gales to the crossing of the equator by the sun has not been proved, and is disputed in certain quarters. However, year-by-year experience seems to bear out the fact that the period between September 20-24 is a period of storms. Why not select a different date?



Flying Cadet Requirements

So many requests have come into the office of Popular Aviation for information about the requirements for entrance into the Army Air Service that we have been unable to answer them by letter. It is our hope that this article will answer all of these letters and will give a clear picture of the qualifications necessary for eligibility. The information given is authentic, being taken directly from the literature of the War Department.

RECENT amendments to the National Defense Act have increased the number of flying cadets that can be accommodated at the Army Flight Schools from 1,300 to 2,500, and at the same time changes have been made in the qualifications required for enlistment or appointment. The large number of applications received have enabled the Air Corps to make the requirements more severe and thus allow the corps a choice of a higher grade of applicants.

Enlisted men of the Regular Army are eligible for appointment as flying cadets, as well as members of the National Guard, and members of the Reserve Officers Training Corps. The appointments are not confined to the three above classes as civilians with certain definite qualifications are also eligible.

The following are the qualifications necessary: The candidate must be an unmarried male citizen of the United States, and between the ages of 20 and 27 years, inclusive. Men must be certified as having satisfactorily completed at least two years of college work, or must possess the equivalent thereof, and must possess excellent character and be of sound physique and in excellent health.

In submitting applications for appointment as a flying cadet, the prospective flyer must conform to a certain routine as set forth by the regulations. If the applicant is a member of the Regular Army, the National Guard or the R. O. T. C. the applications are forwarded through the regular military channels. Civilian applications are sent to the Adjutant General of the Army and must include the regular application blank in triplicate, an affidavit in triplicate, a certificate from a college registrar giving the applicant's record while at college, and three letters of recommendation signed by persons of recognized standing in the applicant's community.

The application sets forth the necessary facts about the candidate and is an agreement that he will accept a commission as second lieutenant in the Air Corps Officers' Reserve Corps (inactive status) if it is offered, and also an agreement that he will enlist for a period of three years upon his official notification of appointment as a flying cadet, and that he will not ask for a release from flying training before the completion of the course.

When an application is approved by the Adjutant General the applicant is ordered to appear before an examining board at one of the following stations:

Boston Airport, East Boston, Mass.
Mitchel Field, Long Island, N. Y.
Bolling Field, Anacostia, D. C.
Langley Field, Hampton, Va.
Maxwell Field, Montgomery, Ala.
Blackwood Field, Nashville, Tenn.
Wright Field, Dayton, Ohio.
Chanute Field, Rantoul, Ill.
Scott Field, Belleville, Ill.
Selfridge Field, Mt. Clemens, Mich.
Fort Snelling, Minn.
Marshall Field, Fort Riley, Kan.
Pittsburgh, Pa.
Brooks Fields, San Antonio, Texas.
Denver, Colo.
Fort Crockett, Galveston, Texas.

Clover Field, Santa Monica, Calif.
Crissy Field, San Francisco, Calif.
Rockwell Field, Coronado, Calif.
Vancouver Barracks, Wash.
Panama Canal Department.
Philippine Department.
Hawaiian Department.
Fort McPherson, Ga.

The examination consists of three parts and includes physical, educational and psychological tests. The purpose of the physical examination is to eliminate those with either defects or disease which would become aggravated by flying training or which would increase the hazard of such training.

The physical standard for flying training is higher than that for enlistment in the Regular Army and the examination is somewhat different. The same physical defects which disqualify for enlistment in the Regular Army also disqualify for flying training, but in addition there are other and severer qualifications which are insisted upon. Vision must be normal, and particular attention is paid to the balance of the ocular muscles. Normal color vision is required. Hearing must be normal, and there must be no obstructions to the nasal passages, or any disease or abnormality of the nose or throat. The applicant's equilibrium must be normal and there must be no tendency toward nervous or mental instability.

In case satisfactory evidence of education is submitted the educational test may be omitted. When it is given it covers algebra, quadratic equations and progressions, plane geometery, English grammar, composition and literature, and history. A good deal of latitude is allowed the candidate with reference to the educational tests as far as concerns grammar, literature and history, as great proficiency is not sought, but the tests are merely to establish the ability of the candidate to read, write and speak good English and to show evidence of being able to master historical facts and to draw conclusions from them.

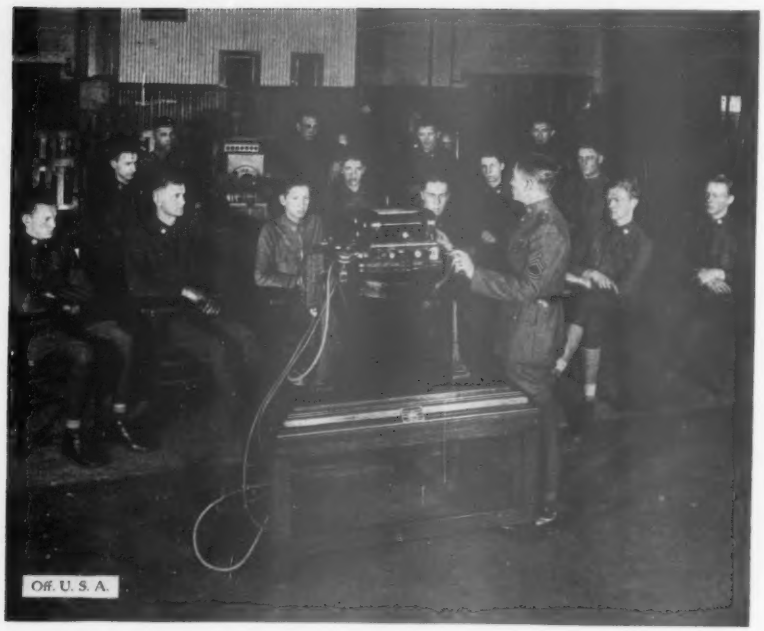
Students working on airplane motor overhaul at Chanute Field, Ill.

Students working in the Fabric Division, Chanute Field, Illinois, learning to cover wings.

The psychological examination consists of a practical test to determine the applicant's reaction time under various stimuli. A practical test is given with the Ruggles Orientator, a fuller account of which will be found in Captain Harmel's article on page 11 of this issue of POPULAR AVIATION. A personality test is also given under the supervision of the flight surgeons. It has been found that these tests determine beforehand whether or not the applicant has inherent flying ability, and it eliminates many of those who would otherwise fail in flying instruction.

Upon qualifying the applicant is placed on an eligible list in the office of the Chief of the Air Corps. At the proper time the applicant is appointed as a flying cadet and ordered to report for flying training with the first class scheduled following the date of his examination. In case there are more qualified candidates than vacancies appointments are made from eligibles in the following order:

First: Enlisted men in the Air



Demonstrating the K3 camera in the photographic department at Chanute Field, Illinois.

Corps; second: other enlisted men in the Regular Army; third: members of the National Guard; fourth: Air Corps R. O. T. C. graduates; fifth: graduates of other R. O. T. C. units; sixth: students in Air Corps R. O. T. C. units who have completed their Junior year; seventh: graduates of recognized universities; eighth: students in recognized universities who have completed their sophomore year; and, ninth: others.

Successful candidates not assigned to the first scheduled class after examination are continued on the eligible list with a view to assignment to the first class in which they may be accommodated. The term of enlistment of a flying cadet is three years, but cadets are discharged upon the completion of, or failure to complete, the prescribed course of instruction.

The appointment of a flying cadet is provisional until he has arrived at a flying school and completed the psychological test. It is then made final, or, if the applicant fails, he is given his discharge and is then furnished with mileage to his home by the government.

Flying cadets are transferred from the point of enlistment to the flying school at government expense. The base pay of a flying cadet is $75.00 per month. Each cadet is allowed not to exceed $1.00 per day for food. The other allowances such as clothing, equipment, etc., are those of a private, first class, Air Corps. Flying cadets are quartered together in a separate barracks provided for the purpose.

In the heavier-than-air training, the duration of training is twelve months, and instruction is given at the Air Corps Primary Flying School and the Air Corps Advanced Flying School. Courses start at each of the schools July 1st, November 1st and March 1st of each year. The primary course requires eight months and the advanced course the remaining four months of the year, and to successfully complete it requires approximately 250 hours in the air.

Machine gun instruction department at Chanute Field, Ill.

Airplane Advertising

THE development and marketing of night electric advertising from airplanes with Neon lights offers such broad possibilities that C. G. Peterson has announced his resignation from the Wright Aeronautical Corporation to carry through this project.

The experimental work on this method of an electric flying signboard with Neon lights has been carried to a successful conclusion by Roland Rohlfs and G. S. Ireland, with whom Mr. Peterson will be associated.

They have conducted numerous tests and demonstrations with this new system of electric display advertising and the patent situation has been well covered.

The tremendous circulation and attention holding features appeal strongly to advertisers while the light weight, low increase of drag and facility with which the equipment can be installed on modern night-flying planes, makes this new method sound from an aeronautical standpoint.

In the seven years that Mr. Peterson has been with the Wright Company as Assistant to the President, he has taken a very active part in the development of commercial aeronautics.

XUM

The Laird Commercial

A three-seater tractor biplane designed for general commercial flying or transport service, by E. M. Laird; manufactured by E. M. Laird Airplane Company, 4500 West 83rd St., Chicago, Ill.

Specifications

General

Type	Open
Use	Commercial
Length, over all	23 ft. 6 in.
Height, over all	9 ft. 3 in.
Spread, over all	34 ft.
Chord	Variable
Crew	1
Passengers (less pilot)	2
Control	Single, stick

Power

Type	Whirlwind
Make	Wright
Rated H. P.	200
R. P. M.	1,850
Cooling	Air

Wing Data

Curve	Laird
Sweepback	None
Dihedral, upper wing	None
Dihedral, lower wing	1°
Stagger	18½ in.
Gap	62 in.
Angle of incidence, upper wing	3°
Angle of incidence, lower wing	2°
Spread, upper wing	34 ft.
Spread, lower wing	30½ ft.

Areas

Ailerons, number	2
Total area	300 sq. ft.

Weight

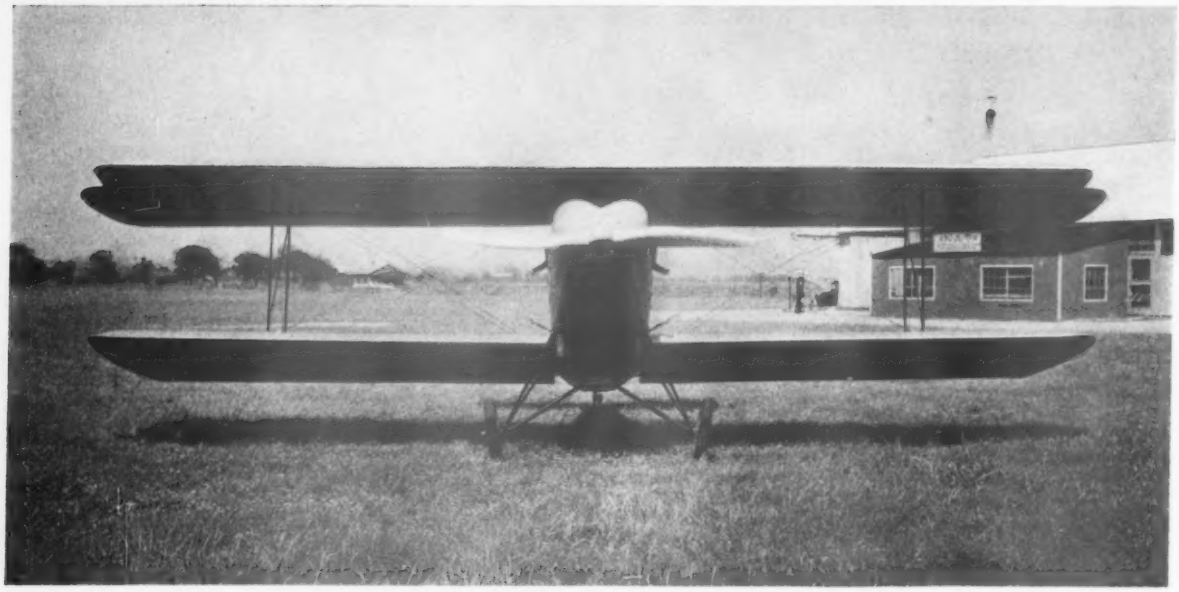
Empty	1,550 lbs.
Fuel, gals.	80 gals.
Pay load	800 lbs.
Gross, ready to fly with load	3,050 lbs.

Performance

Pounds per horsepower, loaded	15 lbs.
Pounds per sq. ft., loaded	10 lbs.
High speed	130 m. p. h.
Cruising speed	110 m. p. h.
Climb in first minute	1,350 feet
Cruising range	6 hrs.

This page, and the other side, is the first of a complete series that it will pay you to save in a loose-leaf binder. Every month POPULAR AVIATION will publish the specifications of different aircraft in a standard form, and the entire series, when kept up to date, will afford you a master index of the types and makes of aircraft in the United States. The selection printed every month is chosen at random by POPULAR AVIATION and no attempt is made to publish the specifications in any order, alphabetical or otherwise.

XUM



The Bird Wing Commercial

A three-seater tractor biplane designed for commercial use by R. T. McCrum; manufactured by the Bird Wing Commercial Aircraft Co., St. Joseph, Mo.

Specifications

General

Type	Open
Use	Commercial
Length, over all	23 ft. 6 in.
Height, over all	9 ft. 8 in.
Spread, over all	31 ft. 8 in.
Chord	62½ in.
Crew	1
Passengers (less pilot)	2
Control	Single, stick

Power

Type	0x5
Make	Curtiss
Rated H. P.	90
R. P. M.	1,400
Cooling	Water

Wing Data

Curve	Aeromarine 2-A, modified
Sweepback	None
Dihedral, upper wing	½°
Dihedral, lower wing	1°
Stagger	14 in.
Gap	61 in.
Angle of incidence, upper wing	1¾°
Angle of incidence, lower wing	1¾°
Spread, upper wing	31 ft. 8 in.
Spread, lower wing	31 ft. 8 in.

Areas

Upper wing, including ailerons	162 ft. 4 in.
Lower wing, including ailerons	141 ft. 6 in.
Ailerons	2, balanced

Weight

Empty	1,235 lbs.
Fuel, gals.	35 gals.
Useful load	1,000 lbs.
Ready to fly, with load	2,544 lbs.

Performance

Pounds per horsepower	23.15 lbs.
Pounds per sq. ft.	6.08 lbs.
High speed	90 m. p h.
Cruising speed	70 m. p. h.
Climb to 1,000 ft.	1 min. 12 secs.
Service ceiling	16,000 ft.
Cruising range	4 hrs.

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XUM

An A B C of Aviation

Simple Aerodynamics

This lesson will be chiefly occupied by an explanation of some of the common terms used in aerodynamics, so that the student will become familiar with their meanings. As in the case with all new studies, words have been adopted in a rather haphazard fashion and it has only been lately that an attempt has been made to standardize the terms used and their meanings.

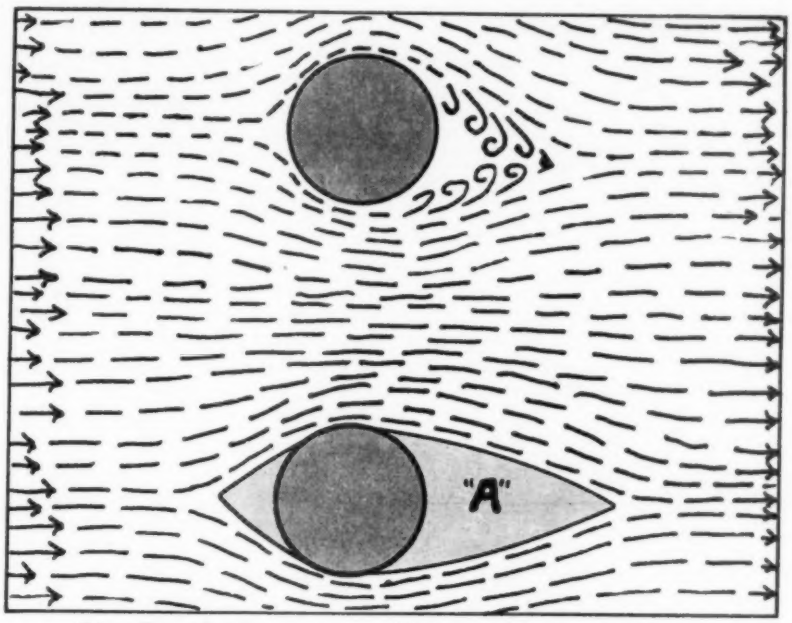
Angle of incidence: This term is not the same as "angle of attack." The angle of incidence is the angle which the chord of the wing makes with the longitudinal axis of the airplane. Both the terms, chord and longitudinal axis have been defined and described in previous lessons in POPULAR AVIATION.

Angle of Attack: The angle of attack of an airplane is the angle between the longitudinal axis and the direction of the relative wind.

Relative Wind: This term is not easy to understand until the student realizes that force can only be relative to an object. Hold a streamer of paper in your hand in still air and it drops downward. There is no wind. Pass your hand through the air at 30 miles per hour and the paper blows out behind. Open the window and let a thirty-mile per hour wind into the room and the paper streams out behind. In one case there was no wind, but your hand made the air pass the paper at a velocity of thirty miles per hour; while in the other case the actual wind passed the paper at the same speed. In both cases in relation to the paper the velocity of the air is thirty miles per hour. In aviation the velocity of the air past the plane is called the relative wind. The velocity of the relative wind is called air speed. The speed with which the plane is moving relative to a fixed point on the ground is called ground speed.

Should you run at ten miles per hour against a wind of twenty miles per hour, the relative wind is 30 miles per hour. Or, you could run at fifteen miles per hour against a wind of fifteen miles per hour and the relative wind would be the same. The air is passing you at that speed. But the ground speed is only ten miles per hour in the first case and fifteen miles per hour in the second.

The direction of the relative wind is in the same line as the path of the center of gravity of the body moving in still air, but of opposite direction. More of this later.



The effect of air currents on cylindrical and streamlined strut.

Streamlining: Every body possessing thickness meets with resistance in the air when in motion. In biplanes, and in some monoplanes, struts are necessary to act as braces for the wings. Everyone knows that the most efficient compression member for a truss is a member with a circular cross section, whether tubular or solid. However, a cylinder offers more air resistance than another shape. The streamline shape, which offers less resistance to the air than the tubular or cylindrical shape, is a shape developed by the study of the deflection of moving air coming in contact with a body. The illustration shows the direction of the force of the moving air against a cylinder (shown in cross section) and against the same cylinder when covered with a streamlined fairing. You will notice that behind the cylinder the air eddys. This eddying of the disturbed air is responsible for the increase in resistance. You will also notice that with the streamlined shape the air passes without eddying, and that less disturbance is set up.

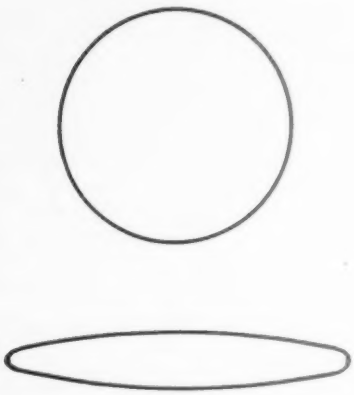
Fineness ratio: The fineness ratio of a streamline shape is the ratio between the dimension parallel to the air stream and the dimension across the air stream. The best ratio of structural strength and weight to resistance is obtained when the fineness ratio is about 1:3.5.

Fairing: Because it is difficult to manufacture struts with a streamline cross section, the common way is to use a tubular strut and obtain the streamline shape by one of two methods. The first is to attach a piece of wood, such a balsa, of the shape "A" as shown in the illustration, binding it to the tube with tape. This gives a streamline shape with a semi-circular entering edge. The other way is to make a fairing of aluminum or duralumin to cover the cylinder and make a

more perfect streamline shape. This fairing would have the shape as shown in the whole section in the illustration.

Even the wires used as bracings—the tension members of the truss system—are streamlined. A solid wire is used, drawn to the shape shown in the illustration. The resistance of this wire is much less than that of stranded cable, which was formerly used.

Slip-stream: Slip-stream is the stream of air driven astern by the propeller. It is obvious that the air is traveling much faster within the slip-stream, so all parts coming within the slip-stream



Streamlined wire in relation to regular stranded cable.

are streamlined as much as possible. As the air is traveling faster the resistance would be greater and as much of it is overcome by streamlining as possible. The radiator, in airplanes using water cooled motors, is the most serious problem as far as resistance goes. The nose type of radiator is responsible for nearly 25 per cent of the total resistance offered by the entire plane. By installing the radiator underneath the nose, the underslung type, this resistance can be cut nearly in half, or more if the nose is streamlined.

Lift—Drag Ratio: This ratio is written as L/D. It is defined as the amount of lift which can be created by a given wing at a certain angle of incidence, divided by the amount of drag (or resistance) which the wing sets up when placed at that angle. The L/D is determined by tests in wind tunnels.

For the benefit of the student who is taking the study of aerodynamics seriously, we append a list of questions which should be answered without reference to the preceding lessons. Then grade yourself on your own answers. The result will show you if the preceding lessons require a review on your part.

1. What are the four essential parts of an airplane?

2. Name the four forces acting on an airplane in flight.

3. What are the three axes of an airplane?

4. Describe the location of the three axes.

5. What is meant by "longitudinal stability?"

6. What is the purpose of the dihedral angle;

7. What is the effect of rigging a plane with less stagger than the amount designed?

8. What is meant by "angle of incidence?"

9. How does a change in the angle of incidence affect the performance of an airplane?

10. What is the purpose of "sweep-back?"

11. What is L/D ratio?

12. What is the difference between Thrust and lift?

13. Describe the difference between Drag and Gravity.

14. What surfaces provide lateral control?

15. What is the difference between a tractor and pusher?

16. What does "yaw" mean?

17. What surfaces are moved by controls in a turn?

18. What is "Gap?"

19. What is the purpose of "Wash-in?"

20. What is angle of attack?

XUM

Model Airplane Construction

By Bertram Pond

DETAILS are an important consideration in anything and especially in model aeroplanes. Therefore it would be well for anyone attempting to build a model to study carefully the drawings of the model, and more carefully study the details and this write-up about them. Many of the I. M. A. C.'s socalled secrets are in this list of details and most of them have been used in the record-breaking models and have enabled our club to capture and retain most of the officially recognized world's records. The records in no instance were made from freak weather conditions or from a favorable altitude—the field over which the land records were made being nearly as flat as the lake over which the Hydro records were made. Our models hold their records on their merits alone which means attention to

Details and Design

"Cans"-Tractor: Cans are one of the chief reasons for the light weight of the machines of the I. M. A. C. members. Even beginners by the use of these cans exceed the records held outside the club. The principal is so very simple—being the same practically as the eyelets on the frail flexible fishing rods. By keeping the pull in either case more nearly parallel to the the "motor-stick" the fullest compressive strength of the material is utilized because the sticks are not put to nearly so great a bending strain. The first cans were really cans for they were in the form of a sleeve an inch or more in length and made from a tin can strip in the bargain. Aluminum was then tried in the search for light weight. Then light strips of bamboo were used and with a great deal of success for they were very light and stood a great deal of punishment; but one had to be very good at bending bamboo to make the small curves necessary. Steel piano wire seems at this date to be the best for they are light, strong, and easy to form. The wire can even be flattened to streamline but this is not necessary. Great care should be taken not to get the cans too small or the rubber will catch on them. The size of the wire used is usually about as follows: No. 8 for six strands on a tractor, except the rear can which is always heavier to take the force of the rubber should it break, and others in proportion to the amount of rubber they must stand. The size of the opening runs about as follows: for two strands of 1/32" sq. 5/32" dia. cans; 2 st. 1/8"x1/32" flat-7/32" dia.; 2 st. 3/16"x1/32" flat-1/4 dia. 4 st. 3/16"x1/32" flat-3/8" dia.; 5 st. 3/16"x1/32" flat-7/16" dia.; and for 6 st. 3/16"x1/32" flat rubber, 1/2" oval cans were used. The cans never receive any great strain except when the rubber breaks and this should not happen very often. However care should be taken to fasten the cans securely to the stick for many contests have been lost through the loosening or losing of a can.

"Cans"—Twin Pusher: Twin push cans should be made of slightly heavier wire than is usually used for tractors on the same number of strands, because they are usually only supported on the one side. The opening may also be made larger for they do not take any strain unless the wing on a bad landing temporarily bends the motor-base, while the cans on a light tractor motor-base take some of the constant bending pull which must be kept as low as possible by small cans keeping the rubber close to the motor-base. In a twin there is no bending strain except at the rear can next to the propellers which can be stopped by a thread across the X brace. Two or, better, three cans is the common number for twin or tractor.

"S" Hooks: -A- is the old style of "S" hook. It always slipped out of the winder or the front hook of the model and caused much trouble. -B- is a much better shape of "S" hook for it will not tear the rubber when it is being slipped into the hook and if properly made it will not slip out of the front or rear hook as the case may be. There is more wire in it but it is a much better hook and is not much harder to make. -C- is no better than -B- except that it can be made of lighter wire because of the safety hook arrangement. It is unhooked like a safety pin and the rubber inserted, then it is locked up again. No. 5 wire will hold 2 strands of 1/8" flat rubber; No. 7, 2 st. 3/16" flat rubber; No. 11, 4 st. 3/16" flat rubber; No. 12, 5 st. 3/16" flat; No. 13, 6 and 7 st., etc. This covers all the power units common to I. M. A. C models. One or two sizes smaller wire can be used with the safety hooks but that is getting on dangerous ground. Always have the one side of the "S" hook big enough to fit in the winder yet small enough to prevent it from coming unhooked during flight.

Twin Push Motor Hooks for large or small machines can be made as shown. A good plan is to have the eyelets that the "S" hook fits into longer than seems necessary in order that there will be no opening for the "S" hook to slip out of. The wire sizes are the same or one size larger than the "S" hook for the same number of strands.

Tractor Motor Hooks suitable for all sizes of machines are shown (two views). Follow the same good plan of extending the wire past the upright piece as shown on the drawing on the part where the "S" hook fastens, to prevent the "S" hook from slipping around and coming out. When a frail wire hook is used the rear end of the eyelet should even be twisted around the upright part of the eyelet to prevent it from coming out.

Hangers or Bearings are made as shown on the drawing and are of the lightest and strongest style as well as the simplest bearing in one piece yet devised. -C- shows a common nail as made without any head as used in making a bearing. -B- shows the nail flattened on both ends and drilled through the head end. (Two views shown.) -A-, shows the finished hanger after being bent and the drilled hole counter sunk from the rear, filed smooth, corners rounded, and the position it is mounted on a twin pusher. (Two views.)

Wire Bearings are suitable only on small models and then mostly on tractors. -A- shows one kind which is fastened to the top of the motor-base. (Three views shown.) -B- is a variation in which the one end is pushed through and bent on the bottom of the stick. This is not supposed to come

loose, but if -A- is fastened on well the extra trouble to make -B- is wasted. Make the hole as round as possible.

Motor-Base Sections are an important consideration for at least one-fourth or more often one-third of the total weight is in the frame. -A- is the most common style of motorstick. It is generally pine or spruce planned to size with the corners well rounded for streamline. The size shown in the drawings would easily hold five strands and would hold six if well braced on a twin push. For a tractor it would just hold four strands and possibly five well braced with cans. -B- is a section of a hollow spar (incidently a section of B. Pond's record tractor spar in full size). The easiest way to make these is to make a U shaped section as shown and then glue a cap to it. The cap must be fastened securely. The spar should be held tightly against a flat surface while the glue is setting. The U shaped section and the cap can be quickly made to the approximate size on a circular saw and finished with a plane, sandpaper and micrometer.

-C- is the section of a Balsa spar suitable for six strands of the size shown. This spar is well rounded to streamline it. -D- is practically a full size section of Mr. B. Pond's dual world's record channel spar twin push frame. This frame stood five strands nicely. It was easily constructed with the use of a rounded wood carvers chisel. -C-D- are not suitable for tractors but a Balsa spar of the size and shape of -B- should hold, hold in this case means just hold, five or six strands or about the same as a hollow pine spar of the size shown with walls .025" in thickness. -B- will hold 8 or 9 strands on a twin pusher. A balancing hook for propellers is a handy thing to have around. It is made from a small piece of shiny piano wire. The shaft of the prop. -C- rests down on -B- and rest up against -A-. With the aid of this hook the heavy side of a prop. can be detected and corrected. All prop. must be accurately balanced.

Propeller Shafts are very similar to "S" hooks on the rubber end and are generally made of the same size wire. -A- is one with a safety hook attachment. The safety hook here must be able to pass through the bearing. -B- is part of a plain shaft like the "S" hook -B- on one end. -B- shows how the wire is bent over and back and then pushed through the propeller. In case the prop. is balsa, and even if it is not it is wise to secure the shaft in place with a little Ambroid cement at -D- and also at -E-. At -E- the prop. can be further protected from wear by a thin piece of copper with a hole in it. Three or four washers should be used on each shaft.

Propeller Clutch enables the model to make a better glide by allowing the propeller to spin freely after the rubber is unwound. -A- shows motor-base with propeller shaft -B- in place for flight. On -B- washer -C- is brazed or soldered securely in place. The prop. -E- is free to revolve on shaft -B- with two bearings—one on either side -D-, until the -F- end of the hook is caught under hook -G- which is fast to propeller -E- by inserting it in the wood and glueing it in the wood with Ambroid (that remarkable preparation, no?). When the rubber is wound up in the proper direction the end of the shaft -B- which is bent over at right angles -F- should be tight against -G- hook on the propeller, thus driving it around when it is released. When the rubber is unwound the propeller should release itself and continue to revolve in the same direction as long as the model continues to glide—thus cutting down the resistance.

Constructing Incidence in Tractor Wings is not met with favor by some flyers but it has several advantages not so apparent from the looks of it. One thing is that both wing clips are alike, another—a change of incidence lends stability to a wing and finally it raises the center of pressure, without a surplus of dihedral, to where it belongs in a hollow spar model. It is claimed that not much efficiency is lost by the drop down.

Wing Clips for Tractors are what hold the wing in place and take up the torque of the air-screw, as well as give the wing its incidence in the majority of cases. -A- is the plain style used on Mr. Pond's indoor and outdoor tractors with such success. They are mounted with Ambroid cement only (which accounts for the success?!!) -B- is made of two pieces of flattened wire bound in place with thread. This was the style used by Mr. P. Breckenridge when he broke three tractor records in one day! -C- is a good common style and if a bit of room is left for adjustment up and down, it is a very handy clip. It takes the torque of the propeller well. -C- is for the rear of the wing and -D- is the same thing for the front of the wing. -E- is practically the same thing as -C- and -D-, except that it is bent around the motor-base as shown. -E- was used on Mr. Pond's 170 sec. indoor tractor model.

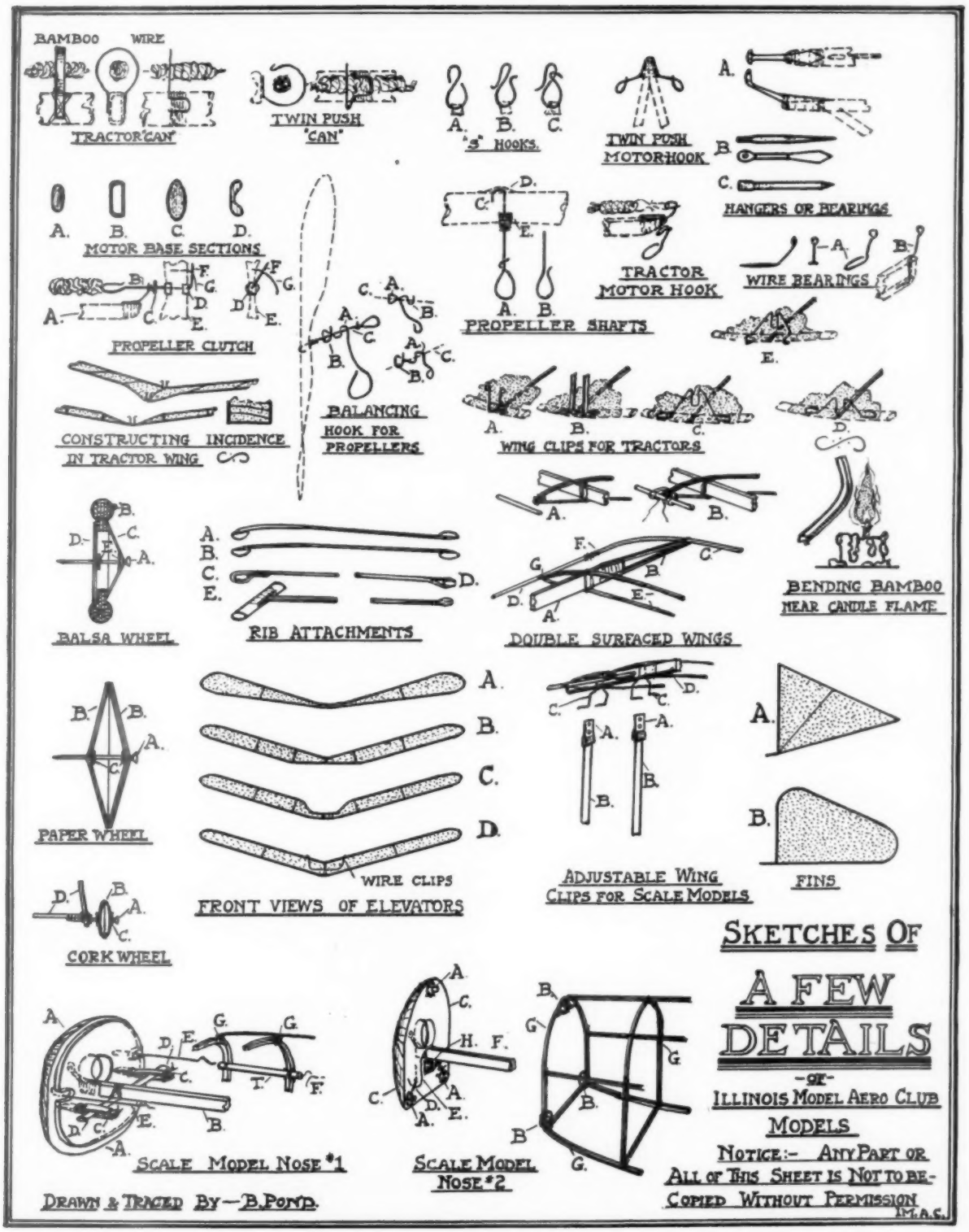
Wheels—Balsa, Paper, Cork. The Balsa wheels represent a realistic appearance and are not so hard to make if one has an electric motor around the house. The rim is turned out of Balsa by using sandpaper as a tool. Then the stiff paper sides -C- and -D- are glued in as shown. Side -D- is one thickness of the stiff paper made into the form of a cone by cutting out a pie shaped piece and glueing the edges together. The washer -E- is then glued securely to the center to be the bearing of the wheel. Another similar piece of paper is glued over the first to make two thicknesses for strength and this is followed by another washer. The hole in the center should be large enough to permit a large dia. pin to pass through and form the axle. The paper wheel is easier to make. It is built up of two sides formed of the familiar cones which are glued together at the edges. Washers are glued inside at the center to form the bearing. They should be spun on an axle and trued before the glue sets. The Balsa and paper wheels are suitable for scale models. The small paper wheels are suitable for R. O. G. twin pushers but the small cork ones are better yet. A piece of Balsa could be used in place of the cork piece -B-. Washer bearings are used as in the other wheels. -D- are the supports to which the axles are attached for use in a twin-push R. O. G. machine.

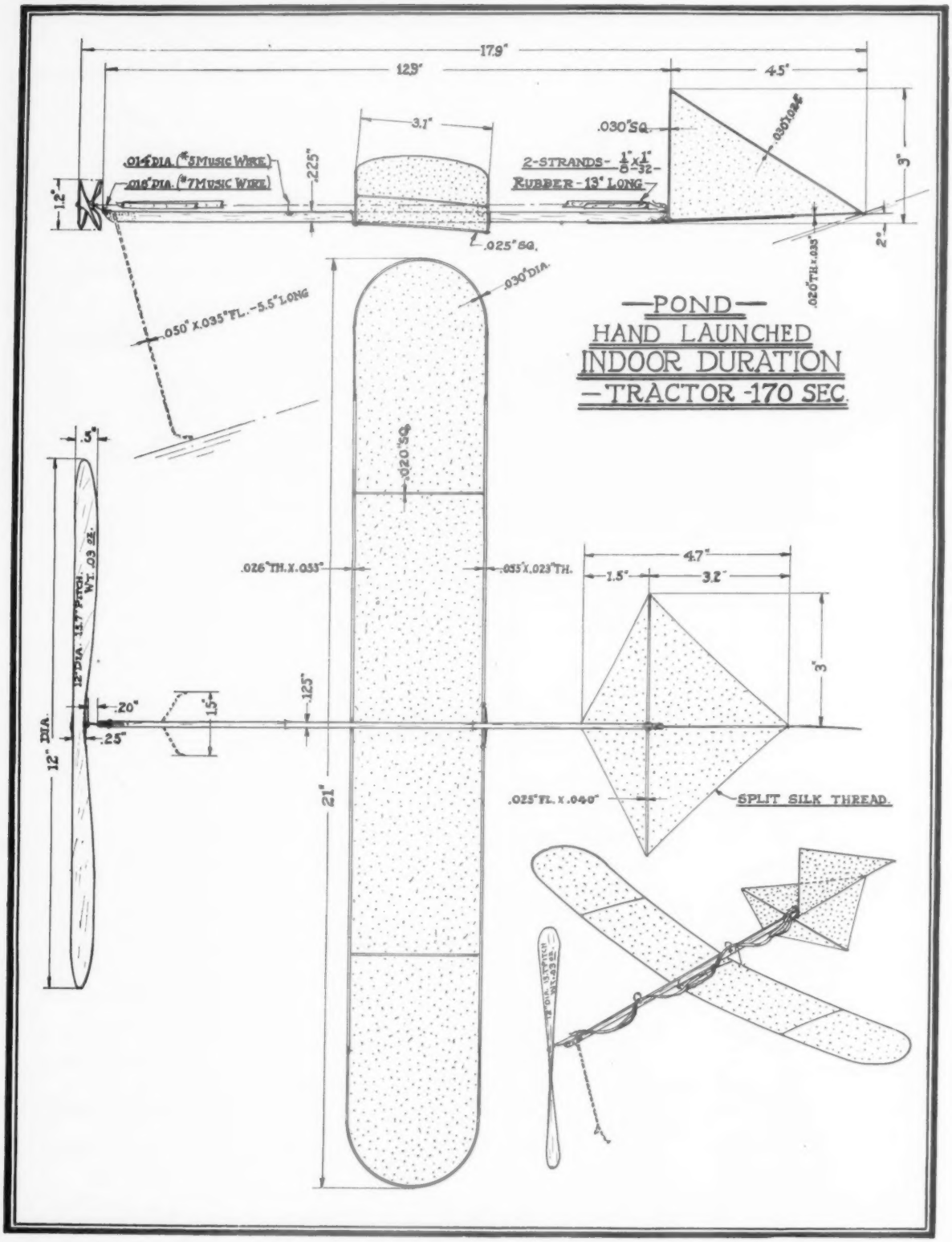
Rib Attachments are of different types. In -A- the front beam is below the rib and the rear beam is above the rib. In -B- both beams are below the rib. One turn of thread is sufficient if glued with Le Pages, but Ambroid properly applied will hold without binding. In -C- Mr. Hittle has struck terror into the heart of the poor bamboo benders by winding the rib around the wing-beam and tying a knot in itself. At -D- the wing-beam is slipped into the split rib and glued into place. In -E- the rib is inserted into the beam as shown in two views. If care is used in gluing a butt joint may be made with the use of Ambroid.

Front View of Elevators show a great deal about elevators at a look. -A- has a variable incidence along its whole length, and being inefficient is not found on record machines now, but some of the old record machines were

(*Continued on page 46*)

Details for Model Builders





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equipped in this manner. -B- is about the best compromise devised so far to eliminate blocks or supports. -C- is a much harder way of doing the same thing as in -B-. -D- is a very efficient elevator, the most efficient in fact, but it takes all the trouble of a wire clip in front to hold it up. Style -B- was used on Mr. Pond's record machines and therefore must be efficient.

Double Surface Wings are more efficient than single surface, but are much harder to construct. -A- is the beam which, if it is of pine, should be close to 1/32 in. thick. The height of the beam depends on the wing section chosen by the builder. -E- are the ribs which are formed as closely as possible to the section copied. A book giving the outline and lift and drift information on 214 different wing sections can be obtained free by writing to the National Advisory Committee on Aeronautics at Washington, D. C. Ribs should be made 1/64 in. sq. to 1/32 in. sq., according to the size of the wing, if the material is of bamboo. If the ribs are of Balsa, 1/16 in., they should be about strong enough and can be hollowed out like the ribs of a large machine to make them lighter. Two bamboo pieces -B- fastened to the end of the wing-beams enable it to stand any shock it may receive in landing. If the brittle white pine is extended to the end of the wing, it would very likely snap off the first time the tip received a severe shock. -C- is the wing tip which should be bound, as shown, to the wing-beam -D- at the point -F-. Entering edge -D- is fastened to the ribs -E-, as shown, directly above the drawing of the wing tips. An expert with Ambroid can do this operation without binding. Entering edges 1/32 in. in diameter will stand the pull of a lightly doped wing with ribs about 2¾ in. broad.

The paper can be stuck on the frame with either Le Page's glue or banana oil, and the surplus paper around the edges cut off with a sharp razor blade. Either one or two wing-beams can be used in a double cover wing.

Bending Bamboo Near a Candle Flame is about the easiest and quickest way to form it. A few simple rules will help an amateur to do this. First use good bamboo, not old dry rotten stuff, scrape the hard outside off as well as the soft inside and then hold it near the flame, either to one side or above, and move the piece back and forth until it commences to bend. -A- can be made much longer than -B- and still not warp easily. If it does commence to warp it can be straightened easily. The cross-piece in -A- keeps the top piece from sagging under the pull of the doped paper.

The next issue of POPULAR AVIATION will contain a full account of the Tournament held at Memphis on October 8th, with pictures of the prize winners and their planes.

Adjustable Wing Clips for Scale Models make it easier to adjust the wings. Wire hooks -C-C- with two loops are fastened over the wing -D-. Aluminum strips -A-A- bent double are fastened to wing struts -B-B- and then drilled twice, as shown. Similar attachment to the rear complete the unit. With this arrangement the wing can be moved backward or forward and also be warped.

Scale Model Nose No. 1 is the same type that is used on the S. E. 5 scale model which was built by Mr. Jaros and flew so well. -A- is the Balsa nose into which are inserted the wires -E- with snap style of end which does not pull out of the tube -T- easily. This can be made of aluminum sheet rolled if no other is suitable. To the nose -A- is also permanently fastened the two bamboo stripes -C- on each side of the hole for the motor-base. The motor-base is thus detachable. To the motor-base -B- is fastened the cross-piece -D-. The front of the nose is rounded to cut down resistance.

Scale Model Nose No. 2 is familiar to I. M. A. C. members. To the nose -C- is attached the block -H- to hold the motor-base in place, by means of the wire spring -E- which is looped under pins -D- which are inserted in the nose. The dress snaps -A- are fastened to the Balsa nose -C- by wire, thead and glue. The other half of the dress snaps are lined up on the body in the proper place.

Dope for Rubber, Covering Surfaces, Etc. The doping of the wings of a model causes considerable trouble for some constructors but for others it does not. To this latter class belong those who do not dope any of their wings except the Hydro wings. Dope is only to lay down the "fuzz" of the paper and make it tight and smooth. Dope must be used with a good deal of judgment or it will shrink the paper too much and spoil the wing. Acetone with 5 or 10 per cent of banana oil makes a very good dope. Pure banana oil is a good Hydro dope, but shrinks most wings out of shape. If shellac is added it will not shrink as much, but weighs much more. A good way to waterproof the paper without warping the wing in the least is to paint a sheet with banana oil, dip it in water and let it dry before it is put on the wing frame. In this case no more dope is added. For pontoons three or four coats of banana oil will keep the water out. The under side can also be varnished to good advantage. Test for leaks by dipping in water. The holes can be plugged with Ambroid. Do not use Le Page's glue on Hydro machines, as it is very likely to loosen up and the parts separate. It is not necessary to dope the wings of light land models. For sticking paper to wings either glue, banana oil, or a mixture of the two can be used, with the preference to the second. Ambroid is a very handy glue to use on models, as the glue dries fairly fast and needs no binding. Anything to be fastened with Ambroid should be so arranged that it will not be disturbed until the glue has dried. It is dry when it is amber brown.

Rubber is kept in good condition longer by keeping it well covered with soapstone when not in use. The rubber should be powdered after every five or six flights with graphite, soapstone, or a mixture of both. Graphite is the best, but is dirty to handle. In making up the motors for a model it is necessary to make a joint in the rubber. The best way to do this is to tie a square knot in the rubber and roll it until it is securely tight. In keeping rubber, light should not be permitted to reach it and oil should be kept off it, for either will injure rubber.

XUM

Pond Indoor Model

The Pond indoor model is a very slow and consistant flyer. At the contest where the model made the flight of 170 sec., the other two official flights were 160.0 and 164.6, making the average 30 sec. more than the former world's indoor record. A model which can perform so consistantly is worth the space in this department. A model design was needed for a model and needed quickly. The builder of this model examined all of the available models around and selected parts on one and parts on another to copy for the present model. The best parts from each model were used. The resulting model won for the constructor a handsome pair of Johnson racing ice skates.

Frame: The frame of the model is balsa wood. The front of the stick is strengthened by a protective coating of Ambroid, about ¾ of an inch back from the nose. This prevents the soft balsa wood from being chipped and broken at that part of the motor base, which is most likely to be broken. The cans and tail pieces are of the size shown and are fastened to the motor base by means of Ambroid cement. No experience of parts so fastened ever coming loose was encountered. The frame barely stood the strain put on it. Two strands of ⅛" flat rubber are used. This amount of rubber, with a little slack, was wound 1,125 turns on the record flight.

Propeller: The 12" propeller used on this machine is of balsa wood also. It is very thin. The shaft was secured in place by a drop of Ambroid on both sides of the propeller. The tips of the propeller are rounded only slightly, as shown in the drawing.

Wing: The wing is of bamboo construction. The parts are of the size shown in the drawings. The ribs and beams and tips are fastened together by means of butt joints, with Ambroid cement. The wing is not very flexible in flight, but is very flexible to handle. The incidence of the wing is adjustable to some extent by a fairly deep can at the rear of the wing. The tail plane at the rear of the motor base has two degrees of incidence—negative—which, with the bend in the motor base, gives the model a rapid climb. The paper on the wing and tail surfaces is not doped. The wing tips are round to prevent the twisting of the wing due to any uneven pulling of the paper. The tissue paper was selected from about 20 sheets for light weight.

Weights: The total weight of this machine is .19 of one ounce! The weight is distributed as follows: rubber motor, .06; motor base, .05; propeller, .03; wing, .05 of an ounce. The total area of the wing is 62 square inches. The loading per square foot is $\frac{144}{62} \times .19 = .441$ ounces per square foot. With such a large wing and so little rubber, the speed of the model is just about the rate a person normally walks. The skid shown in the drawing, in dotted lines, is one suitable for using in case an R. O. G. machine is desired.

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The Queens Aero Club

WHEN a committee representing the Queens Aero Club of Queensboro, L. I., placed a check covering the purchase price of a JN-4 in the hands of Charles Santini, the owner, they brought to completion plans on which members have worked for two months, and in so doing have shown the way to thousands of other similar groups throughout the country.

Working in conjunction with the American Society for Promotion of Aviation, the Astoria Aero Club was organized in July, 1927. From a start of ten members the club quickly reached a membership of over one hundred aviation enthusiasts. It was found necessary to expand its range of activity further than Astoria and the club was reorganized as the Queens Aero Club, covering all of Queens County. As new members from this section were secured by the ASPA, they were directed to the Astoria organization. All members of the Astoria unit are members of the ASPA, the national body sponsoring the work of developing a landing field in every town and organizing a flying club in conjunction with the field. The press of the Queensboro section has supported the club idea with great publicity, which has served to attract many new members. Prominent in the formation of this unit have been Mr. Leo Lowy, president; Thomas Leonard, vice-president; Mr. Peter Kip, treasurer, and William Siegman, treasurer. The donation committee, under the able direction of Mr. Oscar Broyer, Jr., has brought influential aid to the club and has been a prominent factor in molding the organization. The club meets every Thursday evening for instruction lectures. Instructors are provided by the ASPA. The local Democratic club loans its rooms for meetings. In two months, through initiation fees, dues and donations, the club secured not only enough money to buy the JN-4 plane, but have built up a surplus fund which will be used in the purchase of a better plane in the spring of 1928. The JN-4 is not licensed for commercial work. Members of the Queens Aero Club will be flown and instructed by Colonel Roberts, formerly of the R. F. C.; Capt. August Sparre, formerly of the French Air Service, and Lt. J. O'R. Kelley, of the U. S. Air Reserve.

Uniformed men, left to right: Lieutenants Arkow, Relihan, Captain Sparre, Lieutenants Gross, Russell

The new plane will be licensed as a commercial passenger carrier and the club will add to its treasury fund by allowing the pilots to carry passengers on a percentage basis. The plan employed by the Queens Aero Club is a general plan outlined by the American Society for Promotion of Aviation which may be applied in every community in the United States, and through which thousands of young men will be given air training, business developed for light plane manufacturers and a job created for commercial pilots. Members who have "soloed" and those who are taking flying instruction wear the uniform adopted by the ASPA. The ASPA, at its offices, 522 Fifth Avenue, New York City, will be pleased to hear from all desirous of organizing a flying unit in their community. Over forty clubs are already under way and others are being organized.

Beacon Installation News

During the first two weeks of September proposals were issued for the furnishing of 200 course lights for use in connection with the installation of 100 beacons. These beacons will be erected during the next few months. Where commercial power is not available at beacon sites, automatic generating sets will be installed.

The installation of ten beacons, six intermediate fields and a number of acetylene blinker lights on the Pueblo-Cheyenne Airway is under way and it is expected that the construction work will be completed and the equipment in operation before the end of October.

Most of the beacons on the Los Angeles-Apex Airway have been put in commission and the entire route will be lighted in the near future.

The installation of beacons between Richmond and New York on the New York-Atlanta Airway will be started in the near future. Five airway extension superintendents are working at top speed to complete the airway on schedule time.

Bids will shortly be asked for the lighting of the Boise-Pasco Airway. The survey of the Salt Lake-Boise section of the Salt Lake Pasco route is being pushed to completion.

Construction work is actually in operation on three other airways—Dallas-Kansas City, Kansas City-Chicago and Chicago-Twin Cities.

The survey of the Los Angeles-Seattle airway has been completed from Los Angeles to San Francisco. The lighting equipment will be extended approximately 200 miles north of San Francisco.

Lowell, Mass., Airport

The Lowell Airport Corporation of Lowell, Mass., has just been chartered under Massachusetts laws, with a capital of $50,000. The object is to manufacture and deal in all kinds of aircraft and to operate them for transportation and other purposes. The incorpora-

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tors are Blanche Butler Ames, of Tewksbury; Butler Ames and Joseph K. Legare, both of Lowell, and Blanche A. Ames, of Boston.

The new Lowell airport will cover 100 acres on the landing field, affording a 2,000-foot runway in all directions. Although cold weather will delay a part of the work until spring, Mr. Legare, who is in personal charge of the work, thinks that by the end of October sufficient space will have been cleared and leveled to permit use of the field under favorable conditions. The airport is bounded by the Concord river on one side and by the tracks of the Boston & Maine Railroad on the other, and is sufficiently distant from the coast to be free of frequent fogs. A high tower on the property formerly used by a cartridge company as a watertank support will be made into an aerial beacon. Other buildings will be converted into hangars and offices.

Government experts from the United States Department of Commerce, Bureau of Aeronautics, supervised the laying out of the field. Gen. Butler Ames is treasurer and Mr. Legare president of the corporation. General Ames is a pioneer in experimental aviation, and flew his own plane as early as 1910, his theories at that time being tested by the United States navy.

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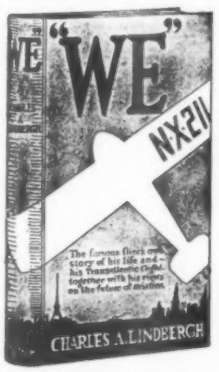

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Licensing of Pilots and Mechanics

Excerpts from Laws Relating to Requirements for Pilot's and Mechanic's Licenses

Sec. 59. Pilots and mechanics, law of.

The Secretary of Commerce shall by regulation—

"Provide for the periodic examination and rating of airmen serving in connection with aircraft of the United States as to their qualifications for such service." [Sec. 3 (*c*).]

"The term 'airman' means any individual (including the person in command and any pilot, mechanic, or member of the crew) who engages in the navigation of aircraft while under way, and any individual who is in charge of the inspection, overhauling, or repairing of aircraft." [Sec. 9 (*k*).]

"It shall be unlawful * * * to serve as an airman in connection with any aircraft registered as an aircraft of the United States * * * without an airman's certificate or in violation of the terms of any such certificate." [Sec. 11 (a).]

"Any person who violates any provision of subdivision (a) of this section * * * shall be subject to a civil penalty of $500." [Sec. 11 (b).]

Sec. 60. Application of the law.

For the purpose of this chapter, persons in command of licensed airplanes in flight will be classed as pilots, and persons repairing or adjusting licensed aircraft in flight and persons in charge of the ground inspection, overhauling, or repairing of licensed aircraft will be classed as mechanics. A workman or mechanic may engage in the repair or overhaul of licensed aircraft without being licensed if such repair or overhaul is in charge of a licensed mechanic.

Sec. 61. Classification of pilots and mechanics.

Licensed pilots are classed as commercial or private pilots. Commercial pilots are licensed as transport, limited commercial, or industrial pilots. Private pilots are designated as private pilots (without other qualifications) or as student pilots. Mechanics are licensed as engine or airplane mechanics. A person may hold a plurality of licenses.

Sec. 62. Privileges and restriction of licensed pilots.

Except as otherwise provided in these regulations, the privileges conferred and restrictions imposed upon licensed pilots are as follows:

(*A*) Transport pilots may pilot any type of licensed aircraft but not unlicensed aircraft carrying persons or property for hire or reward. Transport pilots shall have all of the privileges of navigating aircraft conferred upon other classes of pilots.

(*B*) Limited commercial pilots shall have all of the privileges conferred and

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This license expires April 6th, 1928

The first Pilot's Identification Card issued to William P. MacCracken, Assistant Secretary of Commerce for Aeronautics.

be subject to all of the restrictions imposed upon transport pilots, except they shall not pilot aircraft carrying persons for hire or reward outside of the areas mentioned in their licenses.

(*C*) Industrial pilots may pilot any type of licensed aircraft not carrying persons for hire or reward, but shall not pilot an unlicensed aircraft carrying either persons or property for hire or reward.

(*D*) Private pilots, not designated as students, may pilot licensed airplanes not carrying persons or property for hire or reward. Private pilots designated as students are licensed only for the purpose of piloting licensed airplanes when receiving flying instructions and such student pilots shall not pilot licensed airplanes carrying persons or property for hire or reward or for any other purpose than receiving flying instructions nor within any other area than that specified in their licenses.

Sec. 63. Applications for pilots' and mechanics' licenses.

An application for a pilot's or mechanic's license must be filed, under oath, with the Secretary of Commerce upon blanks furnished for that purpose. An applicant for a pilot's license, including a student's pilot license, must appear for a physical examination before a physician designated by the Secretary of Commerce and pass such examination, unless he is exempt under these regulations. An applicant for a mechanic's license is not required to take a physical examination.

Sec. 64. Character—Age and citizenship qualifications.

An applicant for a pilot's license must be of good moral character. The minimum age requirements are 16 years for private pilots and 18 years for industrial, limited commercial, and transport pilots. A private pilot may be a citizen of any country. An industrial, limited commercial, or transport pilot must be (1) a citizen of the United States, or (2) a citizen of a foreign country which grants reciprocal commercial pilot privileges to citizens of the United States on equal terms and conditions with citizens of such foreign country, or (3) an alien who has filed his declaration of intention to become a citizen of the United States prior to December 31, 1927, and transmits a certified copy thereof to the Secretary of Commerce.

Sec. 65. Flying experience requirements.

An applicant must have at least the following flying experience:

(*A*) *Transport Pilots.*—Two hundred hours of solo flying, of which at least five hours must have been within the last preceding 60 days prior to the filing of the application.

(*B*) *Limited Commercial Pilots.*—The same solo flying required of industrial pilots.

(*C*) *Industrial Pilots.*—Fifty hours of solo flying, of which at least five hours must have been within the last

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preceding 60 days prior to the filing of the application.

Sec. 66. Pilots' physical qualifications.

The physical qualifications for pilots are as follows:

(*A*) *Private Pilots.*—Absence of organic disease or defect which would interfere with safe handling of an airplane under the conditions of private flying; visual acuity of at least 20/40 in each eye; less than 20/40 may be accepted if the pilot wears a correction in his goggles and has normal judgment of distance without correction; good judgment of distance; no diplopia in any position; normal visual fields and color vision; no organic disease of eye or internal ear.

(*B*) *Industrial pilots.*—Absence of any organic disease or defect which would interfere with the safe handling of an airplane; visual acuity of not less than 20/30 in each eye, although in certain instances less than 20/30 may be accepted if the applicant wears a correction to 20/20 in his goggles and has good judgment of distance without correction; good judgment of distance; no diplopia in any field; normal visual fields and color vision; absence of organic disease of the eye, ear, nose, or throat.

(*C*) *Limited Commercial Pilots.*—The same physical qualifications prescribed for transport pilots.

(*D*) *Transport Pilots.*—Good past history; sound pulmonary, cardiovascular, gastrointestinal, central nervous and genito-urinary systems; freedom from material structural defects or limitations; freedom from disease of the ductless glands; normal central, peripheral, and color vision, normal judgment of distance; only slight defects of ocular muscle balance; freedom from ocular disease; absence of obstructive or diseased conditions of the ear, nose, and throat; no abnormalities of equilibrium that would interfere with flying.

(*E*) *Waivers.*—In the case of trained, experienced flyers, the Secretary of Commerce may grant waivers for physical defects designated as disqualifying by these regulations when in his opinion the experience of the pilot will compensate for the defect. A waiver once granted will hold indefinitely so long as the defect for which it was granted has not increased or unless canceled by the Secretary of Commerce.

Sec. 67. Exemption from presecribed physical examination.

An applicant for a pilot's license (or its renewal) will be exempt from the physical examination prescribed in these regulations upon filing with the

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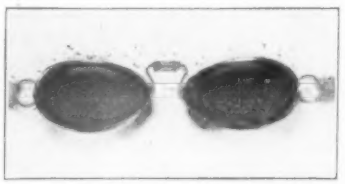

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Secretary of Commerce a certified copy of the examination for flying in the United States Army, Navy, or Marine Corps made within six months of the date of filing his application for his pilot's license or its renewal, provided his physical qualifications as shown by such copy of the examination are not less than those required by these regulations for the class of license for which he applies.

Sec. 68. Pilots' examinations and tests.

Unless exempt under these regulations, candidates must pass the following examinations and tests:

(*A*) *Transport pilots.*—

1. Examination on the air traffic rules.

2. Practical and theoretical examination in elementary engine and plane mechanics and rigging and a theoretical examination in the fundamentals of meteorology and air navigation.

3. Practical flight test, as follows:

(*a*) Glide from 1,500 feet and land, in normal landing attitude, by wheels touching ground in front of and within 300 feet of a line designated by the examining officer. The engine shall idle from 1,500 feet, but the throttle may be used to clear the engine down to the 500-foot height.

(*b*) Glide from 1,500 feet and land, in normal landing attitude, by wheels touching ground in front of and within 100 feet of a line designated by the examining officer. The free use of the engine is optional.

(*c*) Maneuver at 800 feet around two pylons or buoys 1,500 feet apart, making a series of five figure 8 turns.

(*d*) Fly over a triangular or rectangular course at least 100 miles, landing at place of take-off within at least five hours. This flight shall also include two obligatory landings, not at point of departure, when craft must come to rest. The course will be designated and the candidate will be furnished with route information by the examining officer at time of departure and the examining officer will determine whether the course was correctly followed and whether the obligatory landings were satisfactory. Upon the presentation of satisfactory proof that the candidate has engaged in solo cross-country flights a distance of at least 100 miles within one year preceding the date of his application, the flight specified in this subsection will be omitted.

(*e*) Fly in emergency maneuvers, doing spirals, side slips, and recovering from stalls.

(*B*) *Limited Commercial Pilots.*—The same examinations and tests as are prescribed for transport pilots, except the cross-country flight and the examination on elementary meteorology and navigation.

(*C*) *Industrial pilots.*—

1. Examination on the air traffic rules.

2. The practical flight tests prescribed for transport pilots, except the distance for the cross-country flight shall be 60 miles.

(*D*) *Private pilots.*—

1. Examination on the air traffic rules.

2. The practical flight test specified in subparagraph 3 (*c*) of section 68 (*A*) and three satisfactory landings to a full stop. A private pilot, classed as a student, will be licensed without being required to pass the examination and tests prescribed in this subparagraph.

Where seaplanes are used in the flight tests specified herein, the landing distance will be fixed by the Secretary of Commerce for each particular seaplane, according to its type and weight.

Sec. 69. Pilots' exemptions.

Candidates for pilots' licenses, meeting the requirements of section 65 and who make claim for and produce satisfactory proof of their right to the following exemptions will not be required to pass any of the examinations specified in section 68, except the examination on the air traffic rules, and will be licensed as follows, if they possess the requisite physical qualifications:

(*A*) *As Transport or Limited Commercial Pilots.*—

1. Holders of airplane pilot ratings or certificates in the United States Army Air Corps, who are on active duty status in the Regular Army Establishment; or,

2. Holders of naval aviators or naval aviation pilots' certificates in the United States Navy or Marine Corps who are on active duty status in the regular naval establishment; or,

3. Persons actively engaged as pilots for not less than six months within the year preceding the date of application in carrying the United States mail for the Postoffice Department of the United States or contractors thereof.

(*B*) *As industrial pilots.*—

1. Holders of pilots' ratings or certificates, in the reserve organizations of the United States Army, United States Navy, or Marine Corps.

2. Holders of Federation Aeronautique Internationale Aviators' certificates issued prior to May 20, 1926.

3. The persons mentioned in subparagraph (*A*), who have not had the solo flying required by section 65.

(*C*) *As private pilots.*—

1. Any of the classes of persons mentioned in sub-paragraphs (*A*) and (*B*) who have had (1) at least five hours of solo flying within the year immediately preceding the filing of their application, or (2) at least 50 hours of solo flying since the granting of their ratings or certificates.

2. Persons qualified as commercial pilots of any class who prefer to be licensed only as private pilots.

The exemptions mentioned in this section shall cease midnight, December 31, 1927, and will not be applicable to persons whom the Secretary of Commerce finds have unsatisfactory piloting records.

Sec. 70. Place, etc., of examinations.

Examinations for pilots' licenses will be held at such times and places as the Secretary of Commerce shall designate. Such examinations and tests will be conducted by an examining officer designated by the Secretary of Commerce. Candidates for pilots' licenses must furnish the airplanes in which the flight tests are to be made, unless the Secretary of Commerce makes other provisions therefor.

Sec. 71. Duration and renewal of pilots' licenses.

(*A*) Unless sooner revoked, transport and limited commercial pilots' licenses shall remain in force for six months and industrial and private pilots' licenses one year from date of issuance.

(*B*) Licenses will be renewed for like periods where the prescribed physical condition of the holder is shown by the same method as when the original license was issued, except that a transport or limited commercial pilot must prove that he has had at least 10 hours of solo flying within the last 60 days, industrial pilots at least 25 hours within the last year, and private pilots at least 10 hours within the last year.

(*C*) If an applicant for renewal has not had the required solo flying and applies for a renewal within six months after the expiration of his last license, a new license will be issued to him upon

(*Continued on page 62*)

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Questions & Answers

Popular Aviation will endeavor to answer all questions of general interest pertaining to aviation in this department. If personal answers are required please send the Editor a stamped and addressed envelope.

Q.—Would it be possible to publish the regulations of the government which one must pass in order to become a pilot?—J. C., Michigan City.

A.—The article in this issue should answer your question.

Q.—Could you tell me where I can obtain books on aerial navigation and prices of same?—R. L., Quebec, Can.

A.—This issue of POPULAR AVIATION contains several advertisements of reliable and authoritative books on different phases of aviation.

Q.—How do I enter the flying school of the Navy?—K. C. B., Troy, Ohio, and others.

A.—We will publish definite information on this line very shortly in the form of an article. If you feel that you can't wait, write to the Bureau of Aeronautics, Navy Department, Washington, D. C.

Q.—Can one who wears corrective glasses become an efficient aviator?—J. W., Homestead, Pa.

A.—That depends on the amount of correction your eyes need, and what class of pilot license you seek. The government regulations concerning this matter of vision are to be found in an article in this month's issue of POPULAR AVIATION. Your oculist can tell you just what amount of correction your eyes require and if you come within the requirements.

Q.—Can you turn my name over to manufacturers so that I can receive catalogs, etc. J. D., Chicago; A. F. W., Salina, and many others.

A.—Unless this is a matter of business we do not like to bother the manufacturers who are simply swamped with inquiries. We like to accommodate our readers, but at the present time we feel that the manufacturers ought to be allowed to catch their breath, at least. Incidentally it involves our writing to nearly one hundred companies, which is something of a task to go through with every name received.

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An Experimental Airport

By F. N. Hollingsworth

ONE can do almost anything if one has money enough, even to building and equipping an enormous airplane and financing its flight, but few people, even millionaires, can afford the expensive pleasure of laying out and equipping a million dollar airport just to further the science of aeronautics. There is one such man who is doing that right now, however, on his vast private estate of "Round Hills," near New Bedford, Mass., five or six miles from the town of Fairhaven. That man is Col. Edward H. R. Green, son of Mrs. Hetty Green, who was, prior to her death some years ago, reputed to be the world's richest woman. The son, Col. Edward Green, is spending a fortune in furtherance of his hobbies of radio and aviation.

"I have been thinking about an airport for some time," said he in a recent interview. I have plenty of room here to do it, and am willing to move everything except the house, if necessary. And I want to help all I can in experimental work. I want young fellows with good ideas and no money to work them out with, to feel that here is a place they can come. I will grubstake them where their ideas appear sound, and let them perfect and experiment. If they develop anything marketable, they can take it out and it is theirs.

"Maybe in other parts of the country other men will do the same sort of thing. Today scientific investigation in aviation is hampered by its costliness. This will be a center for study and research of that character."

This policy has been followed for some time past in his radio station, and advanced students of the Massachusetts Institute of Technology are carrying on experiments there with expensive apparatus which he has supplied.

In addition to up-to-date facilities for flying, this newest airport, which will have cost around one million dollars by the time it is completed, will be equipped to carry on studies in fog flying, and combating this ever present menace of aviation along the Atlantic Coast. Colonel Green hopes to have experiments carried on with electrically-charged sand as a fog-dispenser, with radio control and radio-pictures such as may be flashed upon the dashboard of an aeroplane trying to make a landing in a dense fog.

The plans of Col. Green have met with some degree of opposition. Col. Green, with the approbation and backing of business men and officials of the city, has planned to secure a strip of land adjoining his Round Hills estate, and with the newly acquired land and part of his present holdings to build a large airport.

This section, or, for that matter, almost any section of New England is behind present day progress in air facilities, and in proportion to population and future needs of air transport is lamentably lacking in ports. Summer residents, however, believe that the port will greatly depreciate their estates and have banded together to oppose Col. Green's plans.

Colonel Edward H. R. Green, who is building a private airport for experimental purposes.

He will not develop a commercial airport. It will be solely for experiment, plus an emergency landing field. He hopes to acquire a plane for himself with a pilot, that will take him on long-distance trips to his Florida and Texas homes when he feels so inclined. Speaking of the fog flying experiments, he said:

"We can give the Government more fog to work with here than at any other place in the country."

Out on the beautiful bay off his point of land he has built a breakwater. It is to be improved and extended to give sheltered water for seaplane landings. The latest type of hangars will be built, with no expense of any sort spared to get the finest thing in the world. His runways will be 3800 feet east and west and 2700 feet southwest and northwest. They are to be 400 feet wide with 150 foot serviceable strips on either side. Sand dredges will pump a low marsh area full within thirty days from starting work. Over 162,000 cubic yards of fill are to be made.

This airport will be a class A flying field in every way. Night lights, fog lights, hangars with electric doors, all the assistance that radio can give (and his station is able to receive from as far as Australia), with machinery, tools and mechanics for every department of aviation will be provided.

Colonel Green has long been interested in aviation. "Back in 1911 five French flyers were stranded in Texas," he said. "Their planes were held at the New Orleans customs house, while five Texas towns wanted them for exhibitions and would pay well for them afterward. But they needed spot cash. So I fixed things up. They put on their tour, paid all their bills and had six thousand dollars to the good. Then they left me. Before they did word had gone to my mother. She wired me she would disinherit me if I flew. But I had already flown the day previous."

Forest Air Patrol

C. M. Granger, district forester at Portland, Ore., has announced the creation of an airplane patrol of the forests of Oregon and Washington. Two army planes will be used and the cost will be borne by the United States forest service, the two states and the private land owners cooperatively. The work will be directed by the United States forest service. During several years four or five planes have been used. Capt. W. J. Chamberlain will operate one plane and be stationed at Eugene, Ore., while the other plane will be stationed at Sand Point airfield. Lieut. L. C. Goldsmith will be the pilot.

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Planes in Mine Rescue

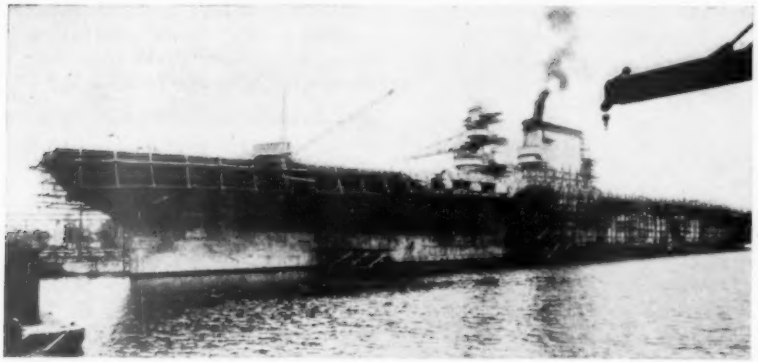
THE airplane has been put to many odd and varied uses, but probably to none more dramatic than its utilization by the veteran mine-rescue men of the federal Bureau of Mines for speedy transportation to the scenes of mine fires and explosions. A large proportion of the thousands of coal and metal mines in the United States are located in out-of-the-way places, to reach which much precious time is consumed when the journey is made by rail or highway. The Bureau of Mines maintains ten railway cars specially equipped with the most modern devices for mine-rescue operations and the administering of first-aid methods. The Bureau also keeps in commission quite a number of automobile trucks which are similarly outfitted.

There is not always a train available, however, with which to move the mine-rescue cars, while the matter of bad highways frequently interferes with the rapid movement of the automobile trucks. The airplane, on the other hand, has the advantage of proceeding as the crow flies, across intervening mountain ranges, disregarding the whole matter of good or bad highways, and recking naught of the proposition of railway schedules. The condition of its highway, the air, is always to be counted on, while as for speed the airplane has all other means of transportation outdistanced.

In order to determine the feasibility of using the airplane for quickly transporting rescue workers to the scene of mine disasters, experiments were conducted in the northern Alabama coal field by the Bureau of Mines in cooperation with the Alabama National Guard. Two National Guard planes, each carrying a National Guard pilot and a Bureau of Mines engineer, with five complete sets of mine-rescue apparatus, flew from the Government mine-safety station at Birmingham to the important coal mining town of Carbon Hill, a distance of 60 miles, in 46 minutes, or at the rate of 80 miles per hour. As the railroads run in that territory, it is estimated that it would have required a special railroad engine three hours to make the trip, even with a clear right of way. An automobile truck, proceeding over winding highways, would have required four hours.

The mine-rescue apparatus used in the test flight weighed about 200 pounds, and the weight of the two pilots and two passengers aggregated about 780 pounds. Not less than five sets of oxygen breathing apparatus are used in all explorations of wrecked mines. Each set of apparatus contains oxygen sufficient to supply breathable atmosphere to the wearer for at least two hours, regardless of the poisonous gases that may be encountered underground.

With landing fields made available in the principal mining communities, it is hoped that the airplane may be especially valuable in supplementing the work of rescue cars and trucks.



Air Liquor Rules

The Imperial Airways, operating passenger craft in England, have announced that "no drinks may be served in an airplane flying over British territory during hours when public houses are closed." After this if an air traveler wants a drink during the closed hours he will have to wait until the plane is at least three miles outside of the territorial limits.

New Airplane Carrier

The photograph shows the U. S. S. Lexington as it appeared in the yards of the Bethlehem Shipbuilding Company at Quincy, Mass. The Lexington is one of the new navy ships that will soon be placed in service. It is said to be an improvement on the Plane Carrier Langley, the last carrier put in service by the navy.

The giant floating hangar is completely electrified, eight motors, developing 22,500 horse-power, being used to drive the ship at a speed of 35 knots an hour.

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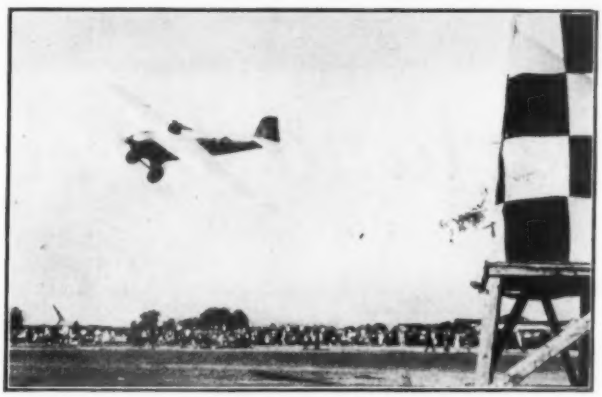

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The Ford-Stout ten passenger plane with crew and passengers on the pioneer flight from Detroit to Jacksonville, Fla.

Overland by Air

P. R. Russell

THAT the recent pathfinding flight of the Ford-Stout, 10-passenger, all-metal plane from Detroit, Mich., to Jacksonville, Fla., was a "100 per cent success" was the declaration of William C. Wakefield, president of the Dixie & Northern Airline.

The tour, made by easy stages in the giant three-motored plane, was heralded by Southern newspapers as a demonstration of practically safe air transportation. It was hailed in Cincinnati, Nashville and Atlanta—intermediate stops of the plane—as a means of restoring public confidence in the commercial value of flying after the recent, tragic failure of so many "stunt" flights.

The airline party kidnapped a "tenderfoot" newspaper man in Nashville and gave him a lift over the clouds to Florida, and in spite of his timidity he observed that the big plane rode smoother than an automobile over a paved road. It is very plain that the backers of this new Northwest to Southeast airline are seeking to eliminate every possible risk in air transportation.

The planes of the line will stay on the ground in unfavorable weather. Areas of the country, such as the mountains of East Tennessee, will be avoided. The route is being carefully selected for the highest degree of safety.

On this trip, a test was made of the manufacturers' claim that if one, and even two, of the three motors failed, the remaining power would be sufficient to drive the plane to a landing field. The several trials made proved that the ship would stay in the air and carry on steadily with two motors and that one motor would push it forward at the rate of 25 or 30 miles an hour. The plane has a fuel capacity for seven hours and is equipped with headlight for use in fog or dark. No night flying will be done unless delay necessitates it.

Cincinnati, Ohio; Nashville, Tenn., and Atlanta, Ga., have been designated as pivot points. Small planes will fly over a wide area and bring passengers to these points for the tour over the main route. Express planes will be used for handling small freight over the route.

Beginning November 7, the schedule calls for a round trip on Mondays and Tuesdays of each week of the Ford-Stout 10-passenger plane. A smaller plane will make a slower trip requiring the remaining four days of the week. Minimum charge for passengers will be based on weight of person and baggage. Two hundred pounds is the limit for one fare and baggage, all over that weight will be charged in excess of the minimum.

A Tennessee charter of incorporation has been applied for by the Dixie & Northern Airline. The following principal backers of the project made the initial trip over the route (as they appear, left to right, in the picture): C. B. Swinson, pilot; W. V. Baker, Jesse C. Morris, Alexander Imlay, Carl H. Keller, Harry R. Graham, Stanley E. Knauss, manager of the Ford-Stout Air Service; William C. Wakefield, president of the company, and Roy C. Conger.

It appears at this time to be a practical demonstration of the utility and safety of air transportation under sensible and careful operation.

Business Aviation Taught

Commercial aviation was granted a place in the curriculum of a business college for the first time when the Boston University School of Business Administration, in its evening division, began a course of "Aviation in Industry," September 23. Dean Everett W. Lord, of the school, made the announcement, and the course was begun by Hilding N. Carlson, assistant professor and former army and commercial aviator. Massachusetts Institute of Technology and New York University have furnished instruction under the same general subject, but these two institutions teach the subject under their divisions of aeronautics. Boston University, it is fairly well established, is the first institution of higher learning in the country to offer the course from the point of view of the business man.

Although the fundamentals of aircraft operation will be covered, the course is not one in the mechanics or science of aviation, but rather looks at the subject from a business standpoint. It will attempt, according to Dean Lord, to "provide a clear and concise analysis of achievements and possibilities of transport aviation, both passenger, freight and express. The costs of operation and on what these costs de-

XUM

pend, the advantages of using air transport in business and a comparison of European and American methods will be included.

"The course will pay particular attention to air transport from the investor's standpoint. It includes such things as investment costs, influence of design and operation, airways, landing fields, night flying equipment, organization and personnel, types of airplane engines, development of air routes, and so on."

"Development of commercial aviation depends to a great extent upon an intelligent understanding on the part of business men as to what aviation can and cannot do," says Professor Carlson. "Aviation is already highly useful and important in some kinds of industry. As the efficiency of aviation increases, its scope of usefulness will broaden. In order that aviation shall best help industry now, industry needs to know what the scope and this efficiency is at present.

"Business men need to know how increased efficiency in transport balances increased cost of using aviation. It is not generally known, for instance, that for some valuable articles, theft insurance is much cheaper if delivery is by air, because chances of pilferage are reduced. The use of multi-engined planes will still further reduce dangers of transportation for non-bulky goods."

Commodore Learns Flying

Marshall Wilbur, 62 years of age, for many years commodore of the Chicago Yacht Club, is learning to fly at the Chicago Municipal Airport. The photograph shows him with his instructor, "Doc" Skoning. After learning to fly Mr. Wilbur plans to purchase a plane and travel extensively. He is not the only aviation enthusiast of his age in Chicago. Charles M. Dickinson, who is now 69 years old, is the pioneer aviation enthusiast of Chicago, and maintains his own plane and uses it as the average business man uses the crack trains on the railroads. Mr. Dickinson was a passenger with E. E. Ballough in the New York to Spokane race, coming in second in the Class "A" event.

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You can obtain parts and supplies for the construction of any of the models shown in Popular Aviation. Write for prices.

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W. G. Fuller, Meacham air field supervisor, won't have to repair any more border lights on his field at Fort Worth when fliers get careless and run them down. Fuller has invented a light standard made of flexible cable, so that when a plane hits the light it bends over without doing damage either to the wing of the plane, or the light.

Newspaper Plane Record

In Germany there are airplanes which are used for the delivery of newspapers exclusively. The newspaper plane of Heinkel completed on March 29, 1927, its 100,000th km. in daily continuous service. The airplane leaves with its load of newspapers daily from the Tempelhofer flying field, in Berlin, and delivers the parcels at the provincial cities within a short time. During 11 months of service 85,400 kg. of newspapers, or 1,306,200 copies, were delivered.—*Die Luftfahrt.*

Longest Air Line

Negotiations have just been concluded by the manager of the Dutch Air Lines for the establishment of a regular air service between Europe and Australia. This will be the longest air line in the world, as it will cover practically two-thirds of the distance around the world.

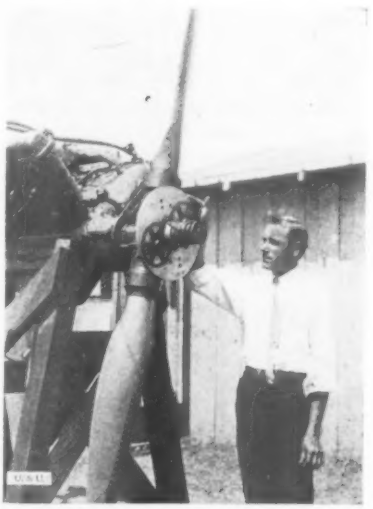
The new route will connect with the regular London-India air line of the British lines and will be via the Dutch East Indies. Express service is an income-producing feature of these lines to an extent not realized by the public, and the new line will not need many passengers to make it a profitable enterprise.

German Air Taxi

The Westphalian Aerial Flight Company, located at Dortmund, Germany, has started an aerial taxi service with one plane that is available to the public at a price of 32 cents a kilometer. For long flights an additional charge is made to cover the pilot's meals and hotel bills. The machine is a Focke-Wulff cabin type all-metal plane and arrangements have been made with the manufacturer to add more planes as the demand for the service increases.

Modern Hamburg Airport

Within a year the new aviation depot in Hamburg will be ready for service. Hamburg is of international importance in air transport, for it is the junction between the Scandinavian and Western air routes. There will be two large, modernly equipped sheds, 100 by 200 and 130 by 260 feet in size, respectively. Every possible recent improvement in aviation equipment will be installed. There will be signal equipment of every kind; smoke signals with wind direction indicator; wireless telegraph; sending, receiving and piloting apparatus; weather forecast service, etc. Special attention is given to separate the public from the passengers at the depot. The field will be surrounded with a high fence to assure safety and order in the air traffic.—*Luftfahrt.*



Brakes for Propellers

A Los Angeles inventor has designed a brake for airplane propellers which conists of a small motor mounted in the center of the propeller. The motor is controlled by means of a push button on the control stick. The motor, when actuated by the push button, changes the angle of the propeller blades until the pitch is completely reversed. This operation changes the propeller from a tractor to a pusher and the inventor claims that it will stop an airplane in twice its length.

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Army Flight Training

(*Continued from page 14*)

Several long-distance cross-country flights are next on the program, 35 hours being allotted therefor, following which the student flies several photographic missions and goes through a period of aerial gunnery practice.

At the end of four months the student steps forth a full fledged airplane pilot. If he is on a cadet status he is honorably discharged and awarded a commission as 2nd Lieutenant in the Air Corps Reserve. If he is an officer from another branch of the military service, he is transferred to the Air Corps of the Regular Army.

In the past few years quite a number of cadets passed the necessary mental examination and were commissioned in the Air Corps, Regular Army. Many cadet graduates, however, do not choose to enter the Army but find a field of lucrative employment in commercial aviation—a field which bids fair to broaden out as a result of the recent impetus given aviation through the remarkable achievements of the several trans-oceanic fliers.

Guiding Planes by Radio

(*Continued from page 20*)

This is a beacon arrangement, whereby a radio wave can be sent along any pole line or insulated cable line, whether it is being used for messages or current transmission. Neither of these two uses interfere with the use of the cable or line for the guiding device.

By means of an interrupting device a signal is sent out over this line. The route selected can be the route over which the flyer passes, and by listening at regular intervals through his head phones the pilot can tell if he is over the line or to one side of it. The intensity of the signals, which come in through small coils mounted at each end of his wings determine his course with reference to the line on the ground.

It is perfectly obvious that hook-ups can be made with telegraph and telephone lines covering the country, and that different signals could be transmitted over different routes, so that the reception of certain definite groups of letters would be indication to the pilot as to his exact location.

By simply keeping the plane on a course that gave him constant signals of the correct intensity and sound the flyer could be guided from one city to another in absolute darkness. A variation of the device that will indicate altitude is now being perfected so that too near an approach to the line on poles near the ground would be indicated to the pilot. This will prove invaluable in mountainous regions, especially where it is necessary to fly through valleys and avoid peaks.

The Pride of Detroit

(*Continued from page 10*)

not the end of the attempt, however, as both men are determined to make this flight again, and to complete the circle of the world in record time.

In the meantime, just for something to do, they plan on breaking the continuous flight record of 52 hours and 22 minutes which was hung up last month by the Germans.

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The last inspection, at Los Angeles, for six old "Jennies," just before their final destruction.

Taps for the Jennies

According to a recent army order, the use of the old JN-4-D's was discontinued and a new type of training plane will take the place of all the old Jennies at the army fields of the air corps. After a final inspection the remaining planes were destroyed. The photograph shows the final appearance of the six H's, powered with Hisso motors, which had been used by the aviation unit of the California National Guard.

Cities Mark Names

Two New Hampshire cities, Portsmouth and Concord, have taken the lead in New England in marking their names for guidance of air pilots. Concord has placed her name in 15-foot letters on the black roof of a building at the edge of the city with a huge white arrow pointing toward the airdrome, a mile away. At Portsmouth the lettering is white on black on the roof of a building in the heart of the city.

New Tiger Moth

The surprising results made in the recent tests of the new DeHaviland Tiger-Moth are giving designers something to talk about. During the latter part of August Mr. H. S. Broad put one of the new DeHaviland light planes through a series of tests that resulted in hanging up another light plane record, which has been submitted to the Federation Aeronautique Internationale for acceptance.

The official speed of this tiny plane was 186.47 miles per hour. Later Mr. Broad took the Tiger-Moth up 20,000 feet in 17 minutes, but stopped at that height, as he did not have oxygen apparatus with him. The plane was still climbing at the rate of 1,000 feet per minute. It is calculated that the ceiling of the new DeHaviland is close to 30,000 feet.

English methods of horsepower rating differ from ours, the engine used being rated at 32 horsepower but developing 130 horsepower at the revolutions per minute at which it is used.

The story is told that the engine and fuselage were designed by having Mr. Broad sit against a wall and chalking his outline on the wall. The front elevation of the engine and the cross section of the fuselage were then said to be designed to accord with the outline. The plane is a low wing monoplane, bracing wires running from each wing to the fuselage top and to the landing gear.

Licensing of Pilots

(*Continued from page 52*)

proof of his physical qualifications and the passing of the flight tests required for the class of license he last held.

(*D*) Upon application to and permission of the Secretary of Commerce, the area for permissible flying of aircraft carrying passengers for hire or reward, designated in the licenses of limited commercial pilots, will be changed to other areas. Upon application and for good cause shown the licenses specified in this chapter may be extended for 60 days.

Sec. 72. Mechanics' qualifications and examinations.

(*A*) An engine mechanic will be licensed upon passing an examination showing that he has sufficient knowledge of internal-combustion engines, electricity, and power plants of airplane types, and can properly inspect, repair, and overhaul airplane engines.

(*B*) An airplane mechanic will be licensed upon passing an examination showing that he is qualified in plane structure, rigging, and control and can properly inspect, repair, and overhaul airplane structures.

(*C*) The examinations for both classes of licenses will be both theoretical and practical, and the candidate must attain an average of at least 70 per cent. A citizen of any country may be licensed if found qualified.

Sec. 73. Duration and renewal.

Mechanics' licenses, unless sooner suspended or revoked, will remain in force for two years after date of issue and will be renewed for additional two-year periods upon proof that during the term of the last license the holder has rendered services under his license during at least one-half of the term thereof. Upon application and good cause shown, the Secretary of Commerce may extend the license for a period of not more than 60 days.

Sec. 74. Suspension or revocation of licenses.

Pilots' and mechanics' licenses will be suspended or revoked for—

(*A*) Violating any provision of the air commerce act of 1926 or these regulations.

(*B*) Carelessness or inattention to duty.

(*C*) Unsound physical condition or

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any demonstration of incompetency in the operation or repair of aircraft.

(*D*) Being under the influence, or using, or having personal possession of intoxicating liquor, cocaine, or other habit-forming drugs while on duty.

(*E*) Refusal to exhibit license upon proper demand.

(*F*) Violating air traffic rules.

Sec. 75. Personal possession of pilots' licenses.

The pilot's license shall be kept in his personal possession when he is piloting aircraft, and must be presented for inspection upon the demand of any passenger or any authorized official or employee of the Department of Commerce.

Sec. 76. Pilots' flight records.

A licensed pilot must keep an accurate record of his flying time.

Sec. 77. Meaning of solo flying.

As used in these regulations, a person is engaged in solo flying when he is the sole operator of the controls and is in command of aircraft, in flight.

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The Moth with the wings folded, showing how compact the plane can be made for housing.

Plane for Clubs

(Continued from page 29)

clubs, of which there are many at various points throughout the island.

The English government is interested in this project, that it may have a large group of civilian flyers available in time of war. By subsidy the government makes it possible for civilian flyers to become pilots at comparatively low cost. In England the cost of becoming a pilot through training in a commercial school ranges from $750 to $1,000.

In joining a light aeroplane club the civilian who wishes to learn to fly pays a membership fee of about $15. A charge of approximately $7.50 an hour is made for flying instruction. This applies either to solo or dual flying. A minimum of eight hours dual instruction is compulsory, but after that the amount of instruction depends upon the pupil. Most civilians can learn to fly, however, for from $100 to $150 in this way. When the pilot-instructor thinks the beginner is sufficiently capable, the latter may take the tests necessary to obtain a license. These tests include those of performing solo, a physical examination and an oral examination.

In addition to this the government also subsidizes the club itself, providing an initial sum of about $10,000 for equipment and an additional $5,000 per year for two years. In case of a complete cracking up of equipment the government also provides half the cost of replacement should there be a complete loss or "write-off."

After members have learned to fly in club planes with club instructors, they can buy their own planes or occasionally use those of the club. Naturally these club planes are held more or less in reserve for the pilot instructors and their pupils and sometimes their schedules are filled for days in advance of flying time. This plan of instruction is quite popular and at the time Mr. Irvin left England the demand for instruction was greater than the facilities available.

Leslie L. Irvin, of Buffalo, N. Y., who has brought a D-H Moth to America.

Well Known Engineer

Walter H. Barling, internationally known aeronautical engineer, who was selected by the United States Government to design and build the Barling Bomber, the largest bombing plane in the world, is now in commercial aeronautics devoting his time entirely to the advancement of private and industrial flying.

Mr. Barling, its builder, was for four years in charge of aeronautical engineering for the British Royal Air Force at the Royal Aircraft Factory. He is a Fellow of the Royal Aeronautical Society, a member of the Society of Automotive Engineers, a Bachelor of Science, a Whitworth Exhibitioner and is the author of many aeronautical papers published by the British Government.

Mr. Barling is now in commercial aeronautics being head of the Engineering Department of the Nicholas Beazley Airplane Company of Marshall, Missouri, the largest aeronautical supply dealers in America. This firm, during the past two years has sold and delivered over 1,800 new engines to commercial manufacturers in addition to building and selling nearly 400 new airplanes. They are also affiliated with the Marshall Flying School of Marshall, Missouri, and have trained hundreds of pilots and airplane and engine mechanics.

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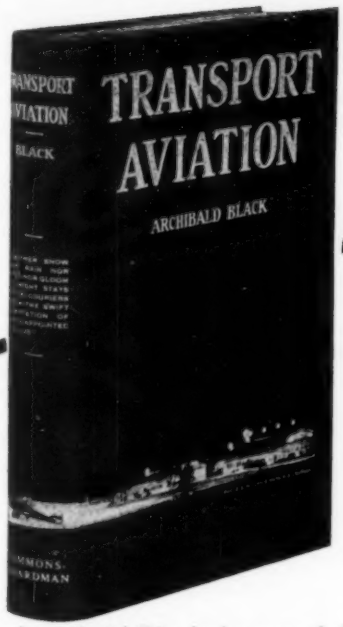

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structor for the Alexander Aircraft Company at Denver, who are sponsoring these lessons as their share in the education of the public in air-mindedness.

Life of Commercial Planes

Under good care and when the plane is built of high grade materials, a long life is possible even with commercial planes, which undergo a regular severe flying service. Of interest are some figures from Europe, where commercial flying is quite well standardized. K. L. M. uses a FII built in 1920, which has undergone but slight repairs; A FIII has flown 1,979 hours. Three FIII's have been sold by the K. L. M. to Balair after having flown, respectively, 2,236, 1,944 and 1,930 hours. Fourteen FIII's of the K. L. M. have flown a total of 17,000 hours. In 1926 six FVII's totaled 3,817 hours, of which one flew 878 and another 702 hours without considerable overhauling or repairs. In 1926 Balair purchased five FIII's from the K. L. M., which were in the best of condition and had flown about 400 hours; they have now flown on the average 2,400 hours each. Among the Junkers' planes, in March, 1927, one had flown about 2,270 hours, another 2,262 hours and still another 2,156 hours, and all were in practically the same condition as when new.—*L'Aeronautique.*

Russians Organize Flying

In Russia there is an association of the friends of Russian aviation, called the "Aviachim." It has about 3,100,000 members located in 32,000 communities. During its existence the association has given the Red Army 200 flying machines, built more than 30 large airports, given several million rubels to research institutes, conducted contests in the flying of model planes and sail planes, developed a huge propaganda for aviation by means of writings, speeches and pictures, and in 1925 has founded in Moscow the Museum of Aviation Engineering, which was opened recently. The "Aviachim" is today the largest flying organization in the world.—*VDI-Nachrichten.*

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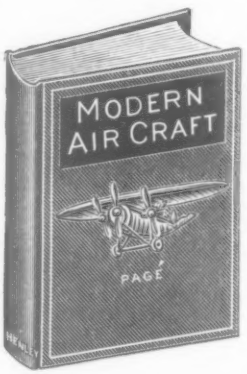

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